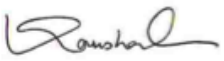
Validation report form for CDM project activities

(Version 04.0)

BASIC INFORMATION	
Title of the project activity	Methane capture project[1]
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the validation report	3.0
Completion date of the validation report	11/11/2020
Version number of the PDD to which this report applies	03
Date when PDD was uploaded for global stakeholder consultation	23/04/2020 – 22/05/2020[2]
Project participants	PT. Tintin Boyok Sawit Makmur
Host Party	Indonesia
Applied methodologies and standardized baselines	**Methodology:** AMS-III.H- Methane recovery in wastewater treatment, Version-19, EB 103, Annex-08 **Standardized baseline:** Not applicable
Mandatory sectoral scopes	**Sectoral Scope 13:** Waste handling and disposal
Conditional sectoral scopes, if applicable	**Sectoral Scope 01:** Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions or GHG removals by sinks	58,985 tCO_2e
Name and UNFCCC reference number of the DOE	KBS Certification Services Private Limited (KBS) Ref. No. E-0051
Name, position and signature of the approver of the validation report	 Kaushal Goyal Managing Director

[1] The title of the project has been revised from the webhosted PDD in accordance with the LoA issued from DNA, however, the project activity is same. Refer to Appendix-4 (CAR 10) for further details.

[2] https://cdm.unfccc.int/Projects/Validation/DB/80LUR75RNDBTY9NRQPJKTI62DILG9A/view.html

SECTION A. Executive summary

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'PT. Tintin Boyok Sawit Makmur' has commissioned KBS to perform the validation of the proposed CDM project activity:

Project Title:	Methane capture project[3]
Methodology Applied:	**Methodology:** AMS-III.H- Methane recovery in wastewater treatment, Version-19, EB 103, Annex-08
Standardized Baseline Applied:	Not Applicable
Sectoral Scopes:	**Sectoral Scope 13:** Waste handling and disposal **Sectoral Scope 01:** Energy industries (renewable - / non-renewable sources)
Validity of methodology/ies (for RfR):	Valid from 14 June 19 onwards

The scope of the validation is defined as an independent and objective review of the project design document, the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against the CDM Validation and Verification Standard for project activities (version 02), Project Cycle Procedure (version 02) and Project Standard (version 02), Kyoto Protocol requirements and UNFCCC rules.

The report is based on the assessment of the project design document undertaken through stakeholder consultations, application of standard auditing techniques including but not limited to desk review, follow up actions (e.g., remote audit, electronic (telephone or e-mail) interviews) and also the review of the applicable approved methodological and relevant tools, guidance and CDM decisions.

The CDM project activity is installation of anaerobic digester system (ZPHB reactor) to treat the POME from the palm oil mill and recover the biogas generated during the treatment. The project activity will also involve recovering the biogas generated during the treatment which can be combusted in DG set (within the mill) for energy generation. The project activity will displace the use of diesel used for power generation for captive consumption. Any excess of the recovered biogas will be flared in a controlled manner in an enclosed flare. The palm oil mill is located at DUSUN BELANDUNG TINTING BOYOK SEKADAU HULU KAB, SEKADAU KALIMANTAN BARAT-79883, Indonesia.

The review of the project design documentation and the subsequent follow-up interviews have provided KBS with sufficient evidence to determine the project's fulfilment of all the stated criteria. In our opinion, the project meets all applicable UNFCCC requirements for the CDM.

☒ Will be recommended to the CDM Executive Board with a request for registration

☐ Is not recommended for registration

[3] The title of the project has been revised from the webhosted PDD in accordance with the LoA issued from DNA, however, the project activity is same. Refer to Appendix-4 (CAR 10) for further details.

SECTION B. Validation team, technical reviewer and approver

B.1. Validation team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Validation findings
1.	Team Leader, Technical Expert (13.1, 1.1)	IR	Kandari	Sanjay	Central Office	√	Remote audit	√	√
2.	Validator	IR	Sharma	Shikha	Central Office	√	Remote audit	√	√
3.	Local Expert	EI	Sembiring	Yenni	Central Office	√	Remote audit	√	

B.2. Technical reviewer and approver of the validation report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Badaya	Rohit	Central Office
2.	Technical Expert (TA 13.1 and 1.1)	IR	Badaya	Rohit	Central Office
3	Manager Technical & Certification	IR	Nanda	Dr. Madhuri	Central Office

SECTION C. Means of validation

C.1. Desk/document review

>> The validation is performed primarily as a document review of the publicly available PDD version 1.0 dated 22/04/2020 and the intermediate versions up to final version 03 dated 05/11/2020. The cross checks between information provided in the PDD and information from sources other than those used, if available, the validation team's sectoral or local expertise and, if necessary, independent background investigations.

C.2. On-site inspection

As a result of the COVID-19 pandemic, taking into account the rules of relevant national and local authorities (local to the DOE offices as well as to locality of the site visits), World Health Organization (WHO) recommendations, policies of the DOE and other relevant travel restrictions and guidance (for example, a requirement to self-isolate upon return from specific countries), the DOE has skipped the on-site visit. However as per the CDM EB, the DOE may use other standard auditing techniques for validation or verification as referred to in sections 7.1.3 and 10.1.3 of the VVS-PA /8/.

As per para 29 of CDM validation and verification standard for project activities version 02 /8/, Validation team has used the following alternative means for its assessment and to justify that they are sufficient for the

purpose of validation of PA. Along with desk review, audit team has conducted remote audit interview as follows:

- A complete desk review of the PDD as well as all applicable country legal requirement and supportive evidences have been checked by the validation team.

- Validation team has performed Skype interview with Project proponent in order to check implementation, current situation, management system of the PA, project technology, location, training provided, start date etc.

- Validation has performed Skype interview with local stakeholders to check the local stakeholder consultation.

- Cross-check evaluation, for information received from interviews, under the scope of all information and references provided in PDD and supporting documents.

Details of interviewees, topics covered and additional information presented in the below section "C.3 Interviews"

Validation team has also checked the site visit requirements mentioned in the VVS for PA Version 02/8/ and concluded that no-site visit is required at this stage of PA. The justification for not conducting the on-site visit as per VVS PA Version 02 /8/ have been mentioned below:

VVS PA Version 02/15/ Requirements	**Validation team Justification**
Para 29 (b) (b) Follow-up actions (e.g. on-site inspection and telephone or e-mail interviews), including: (i) Interviews with relevant stakeholders in the host country, such as personnel with knowledge of the project design and implementation; (ii) Cross checks between information provided by interviewed personnel (i.e. by checking sources or other interviews) to ensure that no relevant information has been omitted;	Validation team has done the follow-up actions by: 1. Telephonic/Skype interviews of PP and Local stakeholders. 2. Cross checks between information provided by interviewed personnel (i.e. by checking sources) to ensure that no relevant information has been omitted.
Para 30 It is mandatory for the DOE to conduct an on-site inspection at validation for the proposed CDM project activity if: (a) Its estimated annual average of greenhouse gas (GHG) emission reductions or net anthropogenic GHG removals is more than 100,000 t CO2 eq; or (b) There is pre-project information that is relevant to the requirements for registration of the project activity and may not be traceable after the registration.	The validation team has not considered the site visit as mandatory due to the following reasons which are in line with the VVS PA Version 02 Requirements. 1. For the Project activity, the estimated annual average of GHG emission reductions or net anthropogenic GHG removals is 58,985 tCO2e which is less than 100,000 t CO2 eq. 2. Also there is no pre-project information that is relevant to the requirements for registration of the project activity and may not be traceable after the registration. Hence, for the proposed PA, it is not mandatory to conduct the physical on-site visit is justified.

~~Duration of on-site inspection:~~				
~~No.~~	~~Activity performed on-site~~	~~Site location~~	~~Date~~	~~Team member~~
~~1.~~				

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Chand	Phool	Director, PA Research & Consultants	18/05/2020 (Skype Interview)	Approval of project activity from Host Party and local clearances Project boundary; Operational lifetime of the project activity, Monitoring plan (feasibility of monitoring arrangements described in PDD, QA/QC procedures, responsibility of implementation of monitoring plan, data recording & storage procedures	Sanjay Kandari Team Leader, Technical Expert (13.1, 1.1) Shikha Sharma (Validator) Yenni Sembiring (Local expert)
2	K R	Raghunath	Managing Director, KIS Group			
3	A C	Suresh	Project representative, KIS Group			
4	K.	Amarnath	Project representative, KIS Group			
5	Ranjan	Ramesh	CPO Mill Advisor, TBSM		Local Stakeholder Consultation process	
6	-	Sapardi	QC, TBSM			
7	Jong	Kim Se	EHSS Advisor, TBSM			

C.4. Sampling approach

>> NA

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Areas of validation findings	No. of CL	No. of CAR	No. of FAR
Demonstration of prior consideration of the CDM	-	-	-
Identification of project type	-	CAR 02	-
Description of project activity	-	CAR 03, CAR 04,	-

		CAR 10	
Application and selection of methodologies and standardized baselines	-	-	-
- Application of methodologies and standardized baselines	-	CAR 05	-
- Deviation from methodology and/or methodological tool	-	-	-
- Clarification on applicability of methodology, tool and/or standardized baseline	-	-	-
- Project boundary, sources and GHGs	-	-	-
- Baseline scenario	CL 05	CAR 06	-
- Demonstration of additionality	CL 01, CL 03, CL 04	CAR 07	
- Estimation of emission reductions or net anthropogenic removals	-		-
- Monitoring plan	CL 01, CL 02	CAR 08	-
Start date, crediting period type and duration	-	-	-
Environmental impacts	-	-	-
Local stakeholder consultation	-	-	
Sustainable development co-benefits	-	-	-
Approval	-	CAR 01	-
Authorization	-	CAR 01	-
Modalities of communication	-	CAR 01	
Global stakeholder consultation	-	-	-
Others (ER sheet)	-	CAR 09	-
Total	05	10	00

SECTION D. Validation findings

D.1. Demonstration of prior consideration of the CDM

Means of validation	The investment decision for the proposed project activity was made on 15/02/2020/32/. The PDD was web-hosted for global stakeholders' comments from 23/04/2020 – 22/05/2020[4]. The start date of the project activity mentioned in PDD is 02/11/2020 /2/ as the date of signed EPC contract /42/. The start date mentioned is after August 02, 2008. The PP had informed host Party DNA/16/ and UNFCCC secretariat (through email /16/) in writing of their intention to seek CDM status on 16/03/2020, which is well before the start date of the project activity. Moreover PDD was published for GSC before the start date of project activity. Therefore the project complies with the requirement of prior CDM consideration stipulated in CDM PS & VVS version 02 for CDM project activities. Based on the document review and remote audit (Skype video conferencing), the assessment team was able to establish that project activity has existing lagoons, wherein biogas recovery system is being introduced in line with the "General guidelines for SSC CDM methodologies" and the start date indicated is indicated as the date of EPC /42/.
Findings	No findings raised.
Conclusion	The assessment team has checked the CDM events mentioned in section B.5 of the final PDD and considered that the starting date of the project is defined in line with the "Glossary - CDM terms" version-10"/13/. The assessment team considers that the CDM was seriously considered in the

[4] https://cdm.unfccc.int/Projects/Validation/DB/80LUR75RNDBTY9NRQPJKTI62DILG9A/view.html

	decision to implement the project and complies with para 39, 41 of CDM VVS V02.0/8/

D.2. Identification of project type

Means of validation	The proposed project activity involves the installation of anaerobic digester system (ZPHB reactor) to treat the POME from the palm oil mill and recover the biogas generated during the treatment. The recovered biogas will be combusted in Gas Engine set (within the mill) for energy generation. The biogas will displace the use of diesel used for power generation for captive consumption. Any excess of the recovered biogas will be flared in a controlled manner in an enclosed flare. The project falls under Type III small scale activity. The project applies AMS-III.H-Methane recovery in wastewater treatment, Version-19/11/. The anaerobic digester used in the project will have the following characteristics, verified from the technical document /14/: • ZPHB reactor tank capacity: 10,800 m^3 • Hydraulic residence time: around 14 days (=10,800 m^3 / 741 m^3/day) • COD removal efficiency: 85% The validation team has confirmed the capacity of the proposed project activity by reviewing the technical specifications/14/ and the PA is expected to generate annual average emission reductions of 58,985 tCO_2e during the crediting period which is lesser than 60,000 tCO_2e annually. Therefore, the validation team is of the opinion that the project activity is eligible as small-scale CDM project activity and can use the simplified baseline and monitoring methodology. The Technology supplier was interviewed during the remote assessment and it was concluded that the technology is in line with the information provided in CDM PDD /2/. **De-bundling:** As per para 9 of the tool "Assessment of de-bundling for SSC project activities, Version 4, EB83, Annex-13), "A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity: *(a) With the same project participants;* *(b) In the same project category and technology/measure; and* *(c) Registered within the previous 2 years; and* *(d) Whose project boundary is within 1 km of the project boundary of the proposed small- scale activity at the closest point."* Since, PP has published another CDM project activity for Global Stakeholder consultation, which is *(a) With the same project participants; and* *(b) In the same project category and technology/measure;* However, the project boundary is not within 1 km of the proposed small scale project activity; as verified by the validation team through crosschecking of the coordinates by using Google earth software and interviews (Skype video conferencing) with the PP. Hence, the project activity is not a de-bundled component of a large-scale project activity.
Findings	CAR #02 was raised and closed satisfactorily. Refer to appendix 4 for further details.

Conclusion	a) The validation team is of opinion that applied small-scale approved baseline and monitoring methodology is approved by UNFCCC and PDD has used the version of the applied baseline and monitoring methodology that is valid at the time of request for registration. b) The PDD has mentioned and correctly applied the tools and guidance relevant as per applied methodology. The project activity is eligible as a small-scale project activity.

D.3. Description of project activity

Means of validation	PT. Tintin Boyok Sawit Makmur is the PP of the proposed project activity, which will be fully financed and implemented by LG International Corp., Korea. The proposed small-scale project activity is methane recovery measures to be implemented in wastewater treatment facility at palm oil mill of PT.Tintin Boyok Sawit Makmur, a subsidiary of LG International Corp., as confirmed from the Letter of identity /41/. It is located at Dusun Belandung tinting boyok sekadauhulu kab, Sekadau Kalimantan Barat -79883, Indonesia. The proposed project activity includes installation of anaerobic digester system (ZPHB reactor) /27/ to treat the POME from the palm oil mill and recover the biogas generated during the treatment. The commissioning date of the project activity is 02/11/2020 as confirmed during the remote assessment by the technology supplier.

Key revisions between the final PDD against the first version published for the international stakeholder consultation		
PDD Section no.	**Brief description of the changes**	**Indicate relevant finding**
Cover page, A.4	*Removed LG International* Corp. *as the key project participant (Only 'PT. Tintin Boyok Sawit Makmur' now). Title of the project activity has been revised.* *Title is revised based on the LoA*	CAR#10
A.1	*Indication of project boundary and small-scale project type (Type I, Type II and/or Type III) applicable to the project activity.*	CAR#02
A.6	*Addition of declaration of PP regarding "The CDM project activity is neither registered CDM project activity nor a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the proposed CDM project activity"*	CAR#04
B.1	*Revision in the reference links for "General guidelines for SSC CDM methodologies (Version 23.0)" and "Sampling and surveys for CDM project activities and programme of activities (Version 04)"*	CAR#05
B.4	*The value of COD removal efficiency of the baseline treatment system and "$COD_{WW,treated,y}$" has been revised.*	CAR#06
B.5	*Values for Post-tax project IRR with CDM revenues made consistent in section B.5 and the sensitivity analysis sheet.* *Variation and breaching values of capital cost, revenue due to diesel & PKS, and O & M cost, made consistent in section B.5 and the sensitivity analysis sheet.*	CL#04, CAR#07
B.6.2	*The source of ex-ante parameter "UF_{PJ}" revised.* *The Choice of data or measurement methods and procedures for ex-ante parameter "$\boldsymbol{EF_{EL,j,y}}$" revised.* *Ex-ante parameter "$SPEC_{flare}$" added.*	CAR#08
B.6.4	*Baseline emissions and emission reductions made consistent with the ER sheet.*	-

	B.7.1	*The parameter "Maintenance$_y$" has been added.*	-
	B.7.2	*Details on sample size calculation of COD inflow and outflow added.*	-
	C.2.2	*Start date of crediting period is updated.*	-

The detailed technical description of the proposed CDM project activity equipment's is provided in the PDD/2/ and validated from the technical specifications/14/ of respective equipment, which were also cross checked during the remote audit from the name plate details. The lifetime of the project operation is considered as 20 years in accordance with the manufacturer's specification, validation team confirms that it is reasonable in context of project activity based on its local and sectoral expertise.

A line diagram, indicating monitoring locations, project boundary and anaerobic treatment system are depicted under section A.3 of PDD /2/ was validated during remote audit (Skype video conferencing) by interviewing the responsible personnel. There was no evidence found during validation indicating that there is any sort of public funding utilized in the proposed CDM project activity. The validation team looked out for the signs of any ODA that project might have received but did not find anything in this regard. Therefore, it can be confirmed that proposed CDM PA did not receive any ODA. A declaration to this effect was also submitted by the project participant /23/.

The project activity is a small scale CDM project.

The estimated emission reductions from the proposed CDM PA amounts to 58,985 tCO_2 eq per year (annual average). The proposed CDM Project Activity is located in Dusun Belandung tinting boyok sekadauhulu kab, Sekadau Kalimantan Barat - 79883, Indonesia. The geo-coordinates of the projects were found to be

Latitude as 0^0 06' 32.1" S

Longitude as 110^0 44' 31.4" E

The proposed CDM project activity is not a CPA that has been excluded from a registered CDM PoA as a result of erroneous inclusion of CPAs and did not find anything to contradict the same. Validation team confirmed it by independently reviewing other GHG and CDM projects in Indonesia.

Findings	CAR #03, CAR #04 and CAR #10 were raised and closed satisfactorily. Refer to appendix 4 for further details.
Conclusion	The validation team conducted document review and remote audit interviews/ inspection of this project activity. Based on the same the validation team confirms that the PDD contains a clear description of the project activity that provides a clear understanding of the precise nature of the project activity. This description is also found to be accurate and complete. The PDD/2/ satisfies the requirements of VVS V2. The details of the remote audit conducted by the validation team can be referred in section C.2 and C.3 of this validation report.

D.4. Application and selection of methodologies and standardized baselines

D.4.1. Application of methodologies and standardized baselines

Means of validation	**Applicability Criteria**	**PP's Justification**	**Means of Validation**
	This methodology	As per Section B.4, the most	The project activity

	comprises measures that recover biogas from biogenic organic matter in wastewater by means of one, or a combination, of the following options: a. Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; b. Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; c. Introduction of biogas recovery and combustion to a sludge treatment system; d. Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an on-site industrial plant e. Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream; f. Introduction of a sequential stage of wastewater treatment with biogas recovery	plausible baseline scenario for the project activity is continuation of current practice i.e. treatment of wastewater in open anaerobic lagoons without biogas recovery. The project activity involves implementation of sequential stage wastewater treatment plant i.e. anaerobic digester system for wastewater treatment with biogas recovery and combustion. Thus, option 1(f) is applicable to the project activity i.e. introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, to an anaerobic wastewater treatment system without biogas recovery.	involves implementation of sequential stage wastewater treatment plant i.e. anaerobic digester system for wastewater treatment with biogas recovery and combustion /27/. The details were validated from the FSR/15/ prepared by the third party, Offer letter by technology supplier (KIS) for the wastewater treatment project dated 01/02/2020/24/ and also validated during the remote audit (Skype video conferencing) by interviewing the top management of organization. Validation team confirms that the project activity complies with applicability 1 (f) of the methodology.

	and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential treatment step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).		
	In cases where baseline system is anaerobic lagoon the methodology is applicable if: a. The lagoons are ponds with a depth greater than two meters, without aeration. b. Ambient temperature above 15°C, at least during part of the year, on a monthly average basis; c. The minimum interval between two consecutive sludge removal events shall be 30 days.	As baseline scenario is, the wastewater continued to be treated in series of anaerobic lagoons without methane recovery. As mentioned in section A.3 of the PDD, the average depth existing open anaerobic lagoons at site ranges from 4-5 meters. The ambient temperature at project site is estimated using the average temperature of the west Kalimantan province. The average annual temperature in this area is 26.7°C[5]. Taking into the consideration of the required manpower to conduct de-sludging, the typical interval between two consecutive sludge removal events would be more than 30 days. Further, as per the publication "Pipeline [6] " the lagoons are able to properly function without sludge removal for up to 5 to 10 years.	The project activity involves implementation of sequential stage wastewater treatment plant i.e. anaerobic digester system. Prior to the PA, anaerobic open lagoons were used having depth of 4-5 meters as verified by the validation team through remote audit interview with the plant personnel and through local and sectoral expertise. Also the ambient temperature of the project site has been verified from the source/43/ and during Skype interviews.

[5] https://en.climate-data.org/asia/indonesia/west-kalimantan/kalimantan-590136/

[6] National Small Flows Claringhouse (1997). *Lagoons Need Proper Operation, Maintenance.* PIPELINE – Spring 1997; Vol. 8, No. 2. http://www.nesc.wvu.edu/pdf/WW/publications/pipline/PL_SP97.pdf

		The recovered biogas from the above measures may also be utilized for the following applications instead of combustion/flaring: a. Thermal or mechanical, electrical energy generation directly; b. Thermal or mechanical, electrical energy generation after bottling of upgraded biogas; or c. Thermal or mechanical, electrical energy generation after upgrading and distribution, in this case additional guidance provided in Annex 1 shall be followed: i. Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; ii. Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or iii. Upgrading and transportation of biogas (e.g. by trucks) to distribution points for end users. d. Hydrogen production. e. Use as fuel in transportation applications after	The recovered biogas will be combusted in a Gas Engine set/boiler for energy generation and any excess biogas will be flared using enclosed flaring system.	PP has chosen option A, wherein the recovered biogas will be combusted for energy generation directly and it was confirmed through remote audit (Skype video conferencing).

	upgrading.		
	If the recovered biogas is used for project activities covered under paragraph 3(a), that component of the project activity can use a corresponding methodology under type I	Even though the generated biogas from the project activity will be used for energy generation, PP will not claim any emission reductions associated with such energy generation.	The validation team through interviews with the PP confirms that the generated biogas from the project activity will be used for energy generation and PP will not claim any emission reductions associated with such energy generation
	For project activities covered under paragraph 4(b), if bottles with upgraded biogas are sold outside the project boundary, the end-use of the biogas shall be ensured via a contract between the bottled biogas vendor and the end-user. No emission reductions may be claimed from the displacement of fuels from the end use of bottled biogas in such situations. If, however, the end use of the bottled biogas is included in the project boundary and is monitored during the crediting period CO_2 emissions avoided by the displacement of fossil fuel can be claimed under the corresponding Type I methodology, e.g. "AMS-I.C.: Thermal energy production with or without electricity".	The project activity does not claim emission reduction from end use of biogas, hence not applicable.	This criterion is not applicable for proposed CDM PA. The project activity involves waste water treatment using anaerobic digester and it was confirmed during remote audit (Skype video conferencing).
	For project activities covered under paragraph 4(c)(i), emission reductions from the displacement of the use of natural gas are eligible under this methodology, provided the geographical extent of the natural gas distribution grid is within	The project activity does not claim emission reduction from end use of biogas, hence not applicable.	This criterion is not applicable for proposed CDM PA. The project activity involves waste water treatment using anaerobic digester and it was confirmed during remote audit (Skype video

	the host country boundaries.		conferencing). Hence, it can be confirmed that that no emission reductions are being claimed for the displacement of the use of natural gas in the case of project activity.
	For project activities covered under paragraph 4(c)(ii), emission reductions for the displacement of the use of fuels can be claimed following the provision in the corresponding Type I methodology, e.g. AMS-I.C.	The project activity does not claim emission reduction from end use of biogas, hence not applicable.	This criterion is not applicable for proposed CDM PA. The project activity involves waste water treatment using anaerobic digester and it was confirmed during remote audit (Skype video conferencing). Hence, it can be confirmed that no emission reductions are being claimed for the displacement of the use of fuels in the case of project activity
	In particular, for the case of paragraph 4(b) and (c)(iii), the physical leakage during storage and transportation of upgraded biogas, as well as the emissions from fossil fuel consumed by vehicles for transporting biogas shall be considered. Relevant procedures in paragraph 18 of the appendix of "AMS-III.H.: Methane recovery in wastewater treatment" shall be followed in this regard.	The biogas produced in project activity is used at site, hence not applicable.	This criterion is not applicable for proposed CDM PA. The project activity involves waste water treatment using anaerobic digester and the biogas used would be produced at site, which was confirmed during remote audit (Skype video conferencing).
	For project activities covered under paragraph 4(b) and (c), this methodology is applicable if the upgraded methane content of the biogas is in accordance with relevant	The project activity does not upgrade biogas, hence not applicable.	This criterion is not applicable for proposed CDM PA. The project activity involves waste water treatment using anaerobic digester

	national regulations (where these exist) or, in the absence of national regulations, a minimum of 96 per cent (by volume).		and it was confirmed during remote audit (Skype video conferencing). Hence, it can be confirmed that there will be no up gradation of biogas in the case of project activity.
	If the recovered is utilized for the production of hydrogen (project activities covered under paragraph 3(d)), that component of the project activity shall use the corresponding methodology "AMS-III.O.: Hydrogen production using methane extracted from biogas".	Not applicable	This criterion is not applicable for proposed CDM PA. The project activity involves waste water treatment using anaerobic digester and the recovered biogas will not be utilized for the production of hydrogen which was confirmed during remote audit (Skype video conferencing).
	If the recovered biogas is used for project activities covered under paragraph 4(e), that component of the project activity shall use corresponding methodology "AMS-III.AQ.: Introduction of Bio-CNG in transportation applications"	Not applicable, as biogas produced is used at site only.	This criteria is not applicable for proposed CDM PA. The project activity involves waste water treatment using anaerobic digester and the biogas will be produced and used at the site, which was confirmed during remote audit (Skype video conferencing).

	New facilities (Greenfield projects) and project activities involving a change of equipment resulting in a capacity addition of the wastewater or sludge treatment system compared to the designed capacity of the baseline treatment system are only eligible to apply this methodology if they comply with the relevant requirements in the "General guidelines to SSC CDM methodologies". In addition the requirements for demonstrating the remaining lifetime of the equipment replaced, as described in the general guidelines shall be followed.	This project activity was having existing lagoons, wherein biogas recovery system being introduced, which complies with the "General guidelines for SSC CDM methodologies". The determination of plausible baseline scenario is presented in section B.4. There will be no equipment replaced; therefore, provisions pertaining to remaining lifetime of the equipment are not relevant to the project activity.	This criteria has been verified by the validation team through remote audit interviews and found ok. Hence, it can be confirmed that the PA has existing lagoons.
	The location of the wastewater treatment plant as well as the source generating the wastewater shall be uniquely defined and described in the PDD.	The location of the wastewater treatment plant will be adjacent to the source of wastewater generation (i.e. the palm oil mill). The location is defined under section A.2 of the PDD	This criteria has been verified by the validation team through remote audit interviews (Google earth software) and found ok. Hence, it can be confirmed that the location of wastewater treatment plant will be adjacent to the source of wastewater generation (i.e. the palm oil mill).
	Measures are limited to those that result in aggregate emissions reductions of less than or equal to 60,000 tCO_2e annually from all Type III components of the project activity.	The project activity is expected to generate annual average emission reductions of 58,985 tCO_2e during the crediting period.	This criteria has been verified by the validation team and found ok. Hence, it can be confirmed that the PA is expected to generate annual average emission reductions of 58,985 tCO_2e during the crediting period which is lesser than

			60,000 tCO_2e annually.
Findings	CAR #05 was raised and closed satisfactorily. Refer to appendix 4 for further details.		
Conclusion	The validation team confirms the following in accordance to VVS V2 /8/ for CDM project activities: i. The applicability conditions of the selected approved methodology AMS-III.H / Version 19.0 /11/ are appropriately described in PDD /2/. ii. The validation of each relevant applicability conditions is described above. iii. The applied methodology /11/ is applicable in the context of the proposed CDM project activity and the selected version of the methodology is valid at the time of submission for registration. Thus, the project activity satisfies the reporting requirements of VVS V02 /8/.		

D.4.2. Deviation from methodology and/or methodological tool

Means of validation	No deviation applied/sought.
Findings	Refer above
Conclusion	Refer above

D.4.3. Clarification on applicability of methodology, tool and/or standardized baseline

Means of validation	No clarification sought by PP on applicability of methodology, tool and/or standardized baseline.
Findings	No finding was raised.
Conclusion	The validation team confirms that no clarification on the selected methodology, tool was applied in the validation of the proposed CDM project activity.

D.4.4. Project boundary, sources and GHGs

Means of validation	Project boundary has been adequately identified and described by PP, which covers all requirements of methodology. All emission sources related to the baseline scenario, project scenario and leakage are clearly identified and described in a complete and transparent manner. The PDD correctly described the project boundary, including the physical delineation of the proposed CDM project activity included within the project boundary for the purpose of calculating project and baseline emissions for the proposed CDM project activity.
Findings	No Findings were raised.
Conclusion	(a) It is confirmed by the validation team that the project boundary and the selected sources of emissions are complete and justified for the project activity. (b) The validation team confirms that PDD has correctly identified and included all the sources of GHG emission relevant to project activity as per methodology AMS-III.H, version 19/11/. (c) Hence, the validation team confirms the project activity meets the requirements of VVS V02 /8/.

D.4.5. Baseline scenario

Means of validation	In the context of the proposed CDM PA the baseline is to be determined as per para 36 and 37 of applied methodology; *in case of existing industrial wastewater treatment facilities, the baseline will be the continuation of the existing system for wastewater treatment*.

	As per CDM project standard Version-02 /8/ the impact of national/sectoral policies assessed on continuation of current practice i.e. treatment of wastewater in anaerobic lagoons without methane recovery. The baseline option is in compliance with all relevant mandatory national and/or sectoral policies, as there is no mandatory legal requirement on selection of technology for treatment of wastewater in Indonesia as verified by the validation team. The project activity is required to treat the wastewater stream and sludge to achieve COD level specified by the host country. The existing regulation applicable to project activity is Ministerial Regulation of Environment number 5/2014 about Waste Water Quality Standards"/15/, which have no regulation on technology selection, however, the waste water quality can be discharged to sea/river is required to be as BOD 100 mg/l and COD 350 mg/l. The current practice at site that is in anaerobic lagoon is in compliance with above regulation. The existing facility i.e. treatment of wastewater (POME) was also found to comply with current effluent discharge standards. The palm oil mill is using an open-air anaerobic lagoon system (without methane recovery) to treat wastewater prior to land application. Therefore, the baseline scenario is the continuation of the present wastewater treatment system and the release of methane into the atmosphere. The documents and sources referred to in the PDD/2/ are correctly quoted and interpreted. The validation team cross-checked the information provided in the PDD/2/ with other verifiable and credible sources. No national policies and/or circumstances were found by the validation team, in consultation with the technical expert that would contradict the selected baseline. No approved standardized baseline that standardizes the baseline scenario was applied.
Findings	CL 05 and CAR #06 were raised and closed satisfactorily. Refer to appendix 4 for further details.
Conclusion	The assessment team confirms that a) All date and assumptions used for identification of baseline scenario are correctly quoted and interpreted in the PDD /2/ along with their sources and references. b) The national/sectoral regulations relevant to project activity has been considered, which establishes that no existing regulation impair the baseline scenario identified in PDD /2/. c) The approved baseline methodology has been correctly applied to identify the most appropriate baseline scenario. Moreover the identified baseline scenario has been reasonably represented thereby confirming that what would have occurred in the absence of the proposed CDM project activity. d) The identification (assumptions and data used) of baseline scenario to the project activity has been correctly applied and is in accordance with applied approved methodology AMS-III.H, version 19 /11/ and justified, deemed reasonable and is based on objective evidences in context to the project activity. The identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

D.4.6. Demonstration of additionality

Means of validation	The PP has demonstrated additionality of the project activity using “Demonstration of additionality of small-scale project activities” Version-13.0/7/”.

Prior Consideration of the Clean Development Mechanism

The investment of the project activity was undertaken on dated 15/02/2020. Investment decision date has been validated from the copy of investment decision/32/.

The start date of this project activity is 02/11/2020 (Date of signing of EPC), which is after the investment decision date i.e. 15/02/2020.

As per Glossary of CDM terms/13/, the start date is defined as "the earliest date at which either the implementation or construction or real action of a project activity begins". For the project activity under consideration, there cannot be any other real action before the EPC as it is earliest event pertaining to commitment of expenditure towards the implementation of the proposed CDM project activity; the validation team accepted the corresponding date (02/11/2020) as the start date for the project activity. According PP has intimated UNFCCC and DNA on 16/03/2020 /16/. The prior intimations were validated from the UNFCCC website[7] and the communications between UNFCCC, DNA and PP.

The PDD was web-hosted for public comments on 23/04/2020, i.e., before the start date of the project activity (02/11/2020). Since the start date of the project activity is after 02/08/2008 and the PDD was web-hosted before the start date, as per para 123 of VVS version 2.0. Project participant is required to notify the Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status and such notification must be made within 180 days of the project activity start date. The PP had informed host Party DNA and UNFCCC secretariat in writing of their intention to seek CDM status on 16/03/2020 /16/, which is well before the start date of the project activity. Moreover PDD was published for GSC before the start date of project activity. Therefore the project complies with the requirement of prior CDM consideration stipulated in CDM PS & VVS version 02 for CDM project activities.

In the proposed CDM project activity, the methodology requires the project participant to determine its additionality based on the tool "demonstration of additionality of small scale project activity, Version-13.0" /7/.

As per para 10 of the applied tool /7/, project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

[7] cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

As validated by the assessment team, the project proponent identified "**investment barrier**" as the most relevant barrier faced by the project activity.

The investment analysis method recommends three analysis methods: simple cost analysis, investment comparison analysis and benchmark analysis. The proposed project produces economic benefits through saving of diesel oil other than CDM related income; therefore, the simple cost analysis cannot be taken. The investment comparison analysis is not applicable to the proposed project as the alternative to project activity is continuation or current practice. And the baseline scenario does not require additional investment.

As per tool Investment Analysis, the benchmark approach is suited to circumstances where the baseline does not require investment or is outside the direct control of the project developer, i.e. cases where the choice of the developer is to invest or not to invest.

Hence, the benchmark analysis is chosen and the project IRR is used as the financial indicator to assess the financial viability of the project activity.

Benchmark:
As per the "Investment Analysis" tool, Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Hence the benchmark for the sub projects is based upon weighted average of the cost of debt and equity component as determined for the project activity. Required/expected returns on equity are appropriate benchmarks for an equity IRR. Benchmarks supplied by relevant national authorities are also appropriate".

Since in this project activity, project IRR has been considered as financial indicator, hence as per tool EB101 Annex11, Local commercial lending rates are considered as appropriate benchmarks and lending rate published by banks has been used.

The lending rate of banks in Indonesia is published and available on public domain hence considered authentic and appropriate. The benchmark thus selected complies as per the relevant guidelines on Investment Analysis.

The lending rate as per bank in January 2020 was 11.43%[8], which is also lowest considering previous trend, hence considered as conservative and appropriate. Validation team considers that the benchmark is reasonably opted by the PP and in compliance with the methodological tool for investment analysis, version 10.0.

Calculation and comparison of financial indicators

Parameters	Value	Unit	Validation remark
Total project cost	2,673,525	USD	The estimated project cost has been taken from the offer letter by technology supplier (KIS) for the wastewater treatment project dated 01/2/2020/17/ which was available

[8] https://www.ceicdata.com/en/indonesia/lending-rate-by-banks/lending-rate-idr-consumption-commercial-bank

and valid at the time of investment decision.

The breakup of the cost as checked from the offer letter by technology supplier (KIS) /17/ is as follows
1. Design, Supply of Equipment's and Mechanical fabrication- 1,526,950 USD
2. DG set- 616,800 USD
3. Civil works/building/Lab equipments- 215,250 USD
4) Total Cost including CDM cost= USD 2,709,525 as verified from the techno commercial proposal /17/
5) CDM cost = 36,000 USD

Therefore, total cost excluding CDM cost = 2,673,525 USD

The key components of the project costs were also cross checked with purchase orders/letter of intent and were found to be in order.

EPC contract/42/ has been signed between PP and technology supplier for the installation of biogas engine only, so, it is incomplete EPC contract.

Therefore, the validation team independently cross-checked project cost from the research paper titled "Techno-Economic Analysis of Biogas Power Plant from POME (Palm Oil Mill Effluent"/40/ for Indonesian palm oil mill , the paper has a case study of palm oil based anaerobic biogas power plant with following specifications:

Plant capacity	240	thousand Ton (alm Fresh Fruit Bunch)
POME produced	120	thousand Ton
Biogas produced	3,360	thousand m3
Potential energy	73,920	Giga J
Electricity generate	7,187	MWh

				d / Generating Capacity: 0.898 ~1 MW The plant data used in the research study has comparable FFB handling capacity and comparable bio digester capacity and power output. The research paper has estimated cost of 2 Million USD for the plant. Since, the project activity also includes the civil cost therefore it is marginally higher than the cited crosscheck. Considering above the validation team is with opinion that project cost used for investment analysis is appropriate and acceptable.
	Annual Diesel cost savings	86,916.4	US$	The value is calculated using (a) the size of the burner (in MT), (b) diesel consumption (litre per MT) based on historical consumption, (c) price per litre of diesel. Also, the value has been verified from the offer letter by technology supplier (KIS) for the wastewater treatment project dated 01/2/2020/17/ and found to be consistent. The calculation in demonstrated in the investment analysis spread sheet and assessed adequate by the validation team. Cost of diesel was taken from the publicly available information[9] and available to PP.
	Diesel price	0.67	USD/litre	The value is based on Diesel price on 9th March 2020 https://www.globalpetrolprices.com/Indonesia/diesel_prices/ . The validation team confirms the value to be consistent with the source and hence, acceptable.
	Escalation on diesel price	3.59	%	The value is calculated based on 10 years average (March 2011 to March 2020)/4/. The calculation is checked and found appropriate. Validation team confirms the percentage based on its local and sectoral expertise.
	PKS saving	16.2	MT/day	The value is calculated based on biogas quantity to be used in boiler.

[9] https://www.globalpetrolprices.com/Indonesia/diesel_prices/

			The calculation is checked and found appropriate. Validation team confirms the cost based on its local and sectoral expertise.
Price of PKS	23.38	US$	The value is Price based on quotation/45/. Validation team confirms the cost based on its local and sectoral expertise. PP has furnished the existing contract of PKS/34/, which has been used as crosscheck and it was concluded that the cost in the contract is within the sensitivity range of PKS.
Revenue from PKS sale	113,626.8	US$	The value is calculated and the calculation is checked and found appropriate. Validation team confirms the cost based on its local and sectoral expertise.
Total revenue	200,543.2	US$	The value is calculated and the calculation is checked and found appropriate. Validation team confirms the cost based on its local and sectoral expertise.
Operation cost including Manpower cost, maintenance & repair and Chemical & Consumables	89,429	US$	The estimated operation cost has been taken from the offer letter of EPC for the project dated 01/02/2020 /17/ which was available and valid at the time of investment decision. The breakup of the cost is as (Man power cost (US$ 59,429), chemical & consumable cost (US$ 30,000). The key components of the operation costs were also cross checked with purchase orders/letter of intent and were found to be in order. Considering above the validation team is with opinion that project cost used for investment analysis is appropriate and acceptable.
Depreciation	133,676	US$	It has been taken from the Income Tax Law 36 of 2008 /46/ and calculated as per the straight line method which has been found consistent. Local expert confirmed the rates.
Income Tax	25	%	It has been taken from the Income Tax Law 36 of 2008/46/ and found to be consistent.

Operational life time	20	years	It has been taken from the offer letter by technology supplier (KIS) for the wastewater treatment project dated 01/2/2020 /17/ which was available and valid at the time of investment decision. Also it has been validated from the manufacturer specification details of the project equipment. Validation team confirms from its local and sectoral expertise that the operational lifetime is reasonable in context of technology proposed in the project activity.

Based on the above input parameters (all input values were valid and applicable at the time of investment decision), PP were able to demonstrate Outcome of the Post-tax Project IRR Assessment

Post-tax project IRR without CDM revenues	**Benchmark**	**Post-tax project IRR with CDM revenues**
2.65%	11.43%	11.24%

The validation team confirms that all the above assumptions are appropriate and are suitable as per standard accounting practices. The parameters have been cross checked from the publicly available sources, wherever possible. Therefore, as per VVS, ver. 2.0. /8/, the input values are validated and confirmed that assumptions are appropriate and financial calculations are correct.

Sensitivity analysis:

In the proposed CDM project activity, Project cost, O & M cost and revenue due to diesel and PKS were considered for sensitivity analysis, which are the important factors which impact the returns from the project. Only variables, including the initial investment cost, that constitute either 20% of the total capital cost (for capital items) or 20% of total sales (for revenue and expenditure items) and which were subjected to variations in values for sensitivity assessment.

Particulars	+10% variations	0% variations	-10% variations	Breaching value
Initial capital outlay	1.91%	-2.65%	3.49%	decrease by 61.50%
Cost saving due to replacement of diesel by biogas and sale of PKS	3.76%	2.65%	1.41%	increase by 99.2%
O &M cost	2.26%	2.26%	3.02%	decrease by 281.2%

The variation in the chosen parameters is highly unrealistic and unlikely to happen

	(to the magnitude required to breach the benchmark) for the following reasons: **Revenue:** The revenue is calculated based on saving due to replacement of diesel and PKS sale, the value is taken on higher side as a conservative approach and increase 99.2% to breach the benchmark value is not a possible scenario as validation team considers the cost is reasonably considered by PP and crosschecked by validation in previous section.. The cost considered by PP was found adequate based on the local and sectoral expertise of validation team. **O & M Cost:** The decrease in O&M cost by 281.2% is hypothetical and is not a realistic scenario considering the long term positive inflation rate in Indonesia cross-checked by validation team by following link: https://www.statista.com/statistics/320156/inflation-rate-in-indonesia/ Therefore validation team rules out any decrease in future in the cost based in past trend. **Project cost:** The cost is taken from the offer letter from technology supplier/17/. The decrease is more than 61.50% to breach the benchmark value which is not a possibility as PP has already considered lower value than cost proposed by removing miscellaneous expenses. Moreover the cost from other similar project is found in same range to proposed cost. Hence, decrease in cost to breach the benchmark value is not likely scenario.
Findings	CL#01, CL#03, CL#04 and CAR #07 were raised and closed satisfactorily. Refer to appendix 4 for further details.
Conclusion	The validation team confirms that: (a) The parameters used in the investment analysis have been thoroughly assessed and found appropriate. The information with regard to how the input values was validated, cross checked is included under relevant parameter. (b) The sources used have been reviewed by the validation team found to be authentic as referenced under relevant parameter. (c) The assumptions and calculations for investment analysis area have been checked by the financial expert and technical expert and found to be correct and reasonable. (d) The financial returns from the project activity area insufficient to meet the required investment against the selected benchmark under reasonable variations (sensitivity) conducted on key parameters. (e) The project activity complies with the latest version of “demonstration of additionality of small scale project activity, Version-13.0”/12/ and “Guidance on the assessment of investment analysis”/13/. The project validation fulfils the condition stipulated in VVS V2.

D.4.7. Estimation of emission reductions or net anthropogenic removals

Means of validation	**Baseline emissions:** The baseline emissions according to the methodology, AMS-III.H, Version 19.0/11/ are given by:

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

where:

BE_y = Baseline emissions in year y (tCO_2e)

$BE_{power,y}$ = Baseline emissions from electricity or fuel consumption in year y (tCO_2e)

$BE_{ww,treatment,y}$ = Baseline emissions of the wastewater treatment systems affected by the project activity in year y (tCO_2e)

$BE_{s,treatment,y}$ = Baseline emissions of the sludge treatment systems affected by the project activity in year y ($t\ CO_2e$)

$BE_{ww,discharge,y}$ = Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year y (tCO_2e).

$BE_{s,final,y}$ = Baseline methane emissions from anaerobic decay of the final sludge produced in year y (tCO_2e).

In case of the project activity, following is not applicable:

1. $BE_{power,y}$ =0 (Since there was no power requirement in the baseline scenario as verified from the remote audit (Skype video conferencing)).
2. $BE_{ww,discharge,y}$ =0 (Since treated wastewater was discharged to water body in the baseline scenario and therefore a conservation approach is taken as verified from the remote audit (Skype video conferencing)).
3. $BE_{s,treatment,y}$ =0 (Since there was no sludge treatment system in the baseline scenario, therefore, the emissions due to sludge treatment systems is considered zero as verified from the remote audit (Skype video conferencing)).

Hence, baseline equation reduces to

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

• **The baseline emissions of the wastewater treatment systems affected by the project activity is calculated using the following equation:**

$BE_{ww,treatment,y} = \Sigma_i(Q_{ww,i,y} * COD_{inflow,i,y} * \eta_{COD,BL,i} * MCF_{ww,treatment,BL,i}) * B_{o,ww} * UF_{BL} * GWP_{CH4}$ Eq.2

Where:

$Q_{ww,i,y}$ Volume of wastewater treated in baseline wastewater treatment system i in year y (m^3). For ex ante estimation, forecasted wastewater generation volume or the designed capacity of the

	wastewater treatment facility can be used. However, the ex post emissions reduction calculation shall be based on the actual monitored volume of treated wastewater
$COD_{inflow,i,y}$	Chemical oxygen demand of the wastewater inflow to the baseline treatment system i in year y (t/m^3). Average value may be used through sampling with the confidence/precision level 90/10
$\eta_{COD,BL,i}$	COD removal efficiency of the baseline treatment system i, determined as per the paragraphs 36 of AMS III.H Version-19
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems i (MCF values as per Table.2 of AMS III.H)
i	Index for baseline wastewater treatment system
$B_{o,ww}$	Methane producing capacity of the wastewater (IPCC value of 0.25 kg CH_4/kg COD)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
GWP_{CH4}	Global Warming Potential for methane (value of 25)

• **The baseline methane emissions from anaerobic decay of final sludge produced by the project activity is calculated using the following equation:**

$$BE_{s,final,y} = S_{final,BL,y} * DOC_s * UF_{BL} * MCF_{s,BL,final} * DOC_F * F * 16/12 * GWP_{CH4}$$

Where,

$S_{final,BL,y}$	Amount of dry matter in the final sludge generated by the baseline wastewater treatment systems in the year y (t). If the baseline wastewater treatment system is different from the project system, it will be estimated using the monitored amount of dry matter in the final sludge generated by the project activity ($S_{final,PJ,y}$) corrected for the sludge generation ratios of the project and baseline systems as per equation (5) of AMS III.H Version-19
$MCF_{s,BL,final}$	Methane correction factor of the disposal site that receives the final sludge in the baseline situation, estimated as per the procedures described in the methodological tool "Emissions from solid waste disposal sites"
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis). Default values of 0.5 for domestic sludge and 0.257 for industrial sludge shall be used
j	index for baseline sludge treatment system
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)

Using the above parameters, the total baseline emission is estimated as **69,847 tCO_2e/year** (rounded down).

Project emissions

The project activity emissions from the systems affected by the project activity according to the methodology, AMS-III.H, Version 19.0/11/ are calculated using the below equation:

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

Where

PE_y	=	Project activity emissions in the year y (t CO_2e)
$PE_{power,y}$	=	Emissions from electricity or fuel consumption in the year y (t CO_2e). These emissions shall be calculated as per paragraph 26, for the situation of the project scenario, using energy consumption data of all equipment/devices used in the project activity wastewater and sludge treatment systems and systems for biogas recovery and flaring/gainful use
$PE_{ww,treatment,y}$	=	Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (t CO_2e). These emissions shall be calculated as per equation (2) in paragraph 27 using an uncertainty factor of 1.12 and data applicable to the project situation ($MCF_{ww,treatment,PJ,k}$ and $\eta_{,PJ,k,y)}$ and with the following changed definition of parameters:
$PE_{s,treatment,y}$	=	Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (t CO_2e). These emissions shall be calculated as per equations (3) and (4) in paragraphs 30 and 31, using an uncertainty factor of 1.12 and data applicable to the project situation ($S_{l,PJ,y}$, $MCF_{s,treatment,l}$) and with the following changed definition of parameters:
$PE_{ww,discharge,y}$	=	Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater in year y (t CO2e). These emissions shall be calculated as per equation (6) in paragraph 33 of AMS III.H V19, using an uncertainty factor of 1.12 and data applicable to the project conditions ($COD_{ww,discharge,PJ,y}$, $MCF_{ww,PJ,discharge}$) and with the following changed definition of parameters:
$PE_{s,final,y}$	=	Methane emissions from anaerobic decay of the final sludge produced in year y (t CO_2e). These emissions shall be calculated as per equation (7) in paragraph 35, using an uncertainty factor of 1.12 and data applicable to the project conditions ($MCF_{s,PJ,final}$, $S_{final,PJ,y}$). If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in aerobic conditions in the project activity, this term shall be neglected, and the sludge treatment and/or use and/or final disposal shall be monitored during the crediting period with the following revised definition of the parameters:
$PE_{fugitive,y}$	=	Methane emissions from biogas release in capture

systems in year y, calculated as per paragraph 40 (t CO_2e)

$PE_{flaring,y}$ = Methane emissions due to incomplete flaring in year y (t CO_2e). For ex ante estimation, baseline emission calculation for wastewater and/or sludge treatment (i.e. equation (2) and/or equation (3)) can be used but without the consideration of GWP for CH_4. However, the ex post emission reduction shall be calculated as per methodological tool "Project emissions from flaring"

$PE_{biomass,y}$ = Methane emissions from biomass stored under anaerobic conditions. If storage of biomass under anaerobic conditions takes place in the project and does not occur in the baseline, methane emissions due to anaerobic decay of this biomass shall be considered and be determined as per the procedure in the methodological tool "Emissions from solid waste disposal sites" (t CO_2e)

In case of the project activity, following is not applicable:

- $PE_{WW,treatment,y}$ = 0 (Since there is no system in the project activity not equipped with biogas/methane recovery, therefore it is considered zero as verified from the remote audit (Skype video conferencing)).
- $PE_{s,treatment,y}$ (Since there was no sludge treatment system in the baseline scenario, therefore, it is considered zero as verified from the remote audit (Skype video conferencing)).
- The methodology states that "*If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in aerobic conditions in the project activity, this term shall be neglected, and the sludge treatment and/or use and/or final disposal shall be monitored during the crediting period.*" Therefore, $PE_{s,final,y}$ = 0 (Since sludge disposition in this project is soil application. However the quantity of sludge generation and usage will be monitored ex-post as verified from the remote audit (Skype video conferencing)).
- $PE_{biomass,y}$= 0 (Since there will be no biomass stored under the project activity as verified from the remote audit (Skype video conferencing).

Hence project emission is estimated using the final equation:

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

• Project emissions from electricity and fuel used by the project facilities

The project emissions from electricity and fossil fuel consumption ($PE_{power,y}$) are determined as per the procedures described in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" Version-03/12/ and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" Version-03, respectively.

Project emissions from electricity consumption

As per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, version 03", /12/,

	the equation is stated as follows: $PE_{y,DG} = EC_{PJ,DG,y} * EF_{CO2,DG}$ Where, $PE_{y,DG}$ =Project emission due to electricity generation in DG set in year y(tCO_2e) $EC_{PJ,DG,y}$= Electricity generation in DG set in year y (MWh) $EF_{CO2,DG}$= Emission factor of DG set (tCO_2/MWh) As per the tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, version 03", /12/, one of the following scenarios may be applicable to or selected by project activity: **Scenario A:** Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer; **Scenario B:** Electricity consumption from an off-grid fossil fuel fired captive power plant. One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid. **Scenario C:** Electricity consumption from the grid and fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumption source. The captive power plant(s) can provide electricity to the electricity consumption source. The captive power plant(s) is/are also connected to the electricity grid. Project Participant has chosen "**Scenario B**" as verified by the verification team through remote audit (Skype video conferencing). Therefore, the generic approach has been used to calculate the project emissions. Under "Scenario B, The project participant has decided to use option B2 conservative default value. **Scenario B: Electricity consumption from an off-grid captive power plant** The project participant has chosen option B2 conservative default value which states the following: (a) A value of 1.3 t CO_2/MWh if: (i) The electricity consumption source is a project or leakage electricity consumption source; or (ii) The electricity consumption source is a baseline electricity consumption source; and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is less than the electricity consumption of all project electricity consumption sources at the site of the captive power plant(s); (b) A value of 0.4 t CO_2/MWh if: (i) The electricity consumption source is a baseline electricity consumption source; or (ii) The electricity consumption source is a project electricity consumption

source and the electricity consumption of all baseline electricity consumptions sources at the site of the captive power plant(s) is greater than the electricity consumption of all project electricity consumption sources at the site of the captive power plant(s).

Project emissions from fossil fuel consumption

As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, Version 03".

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \Sigma_i FC_{i,j,y} * COEF_{i,y}$$

where:

$PE_{FC,j,y}$	The CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr).
$COEF_{i,y}$	CO_2 emission coefficient of fossil fuel type i in year y (tCO_2/mass or volume unit).
i	Fuel type combusted in process j during the year y.

The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using one of the following two Options, depending on the availability of data on the fossil fuel type i, as follows:

(a) Option A: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on the chemical composition of the fossil fuel type i, using the following approach:
If $FC_{i,k,y}$ is measured in a mass unit:

$$COEF_{i,y} = w_{c,i,y} \times 44/12$$

If $FC_{i,j,y}$ is measured in a volume unit:

$$COEF_{i,y} = w_{c,i,y} \times \rho_{I,y} \times 44/12$$

Where,

$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type i (tCO_2/mass or volume unit);
$w_{c,i,y}$	=	Is the weighted average mass fraction of carbon in fuel type i in year y (tC/mass unit of the fuel)
$\rho_{I,y}$	=	Is the weighted average density of fuel type i in year y (mass unit/volume unit of the fuel)
i	=	Are the fuel types combusted in process j during the year y

(b) Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$COEF_{i,y} = NCV_{i,y} * EF_{CO2,i,y}$

Where,

$COEF_{i,y}$ Is the CO_2 emission coefficient of fuel type i (tCO_2/mass or volume unit);

$NCV_{i,y}$ Weighted average net calorific value of the fuel type i in the year y (GJ/mass or volume unit).

$EF_{CO2,i,y}$ Weighted average CO_2 emission factor of fuel type i in year y (tCO_2/GJ).

i Are the fuel types combusted in process j during the year y

- **Project emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater is calculated using the following equation:**

$PE_{ww,discharge,y} = Q_{ww,discharge,y} * GWP_{CH4} * B_{o,WW} * UF_{PJ} * COD_{ww,discharge,PJ,y} * MCF_{ww,discharge,}$

Where:

$PE_{ww,discharge,y}$ Methane emissions from degradable organic carbon in treated wastewater in year y (tCO_2e).

$COD_{ww,discharge,PJ,y}$ Chemical oxygen demand of the treated wastewater discharged to the sea, river or lake in the project scenario in year y (t/m^3)

$MCF_{ww,PJ,discharge}$ Methane correction factor based on the discharge pathway of the wastewater in the project scenario (e.g. into the sea, river or lake) (MCF values as per Table 2)

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

GWP_{CH4} Global warming potential for methane

$Q_{ww,discharge,y}$ Amount of wastewater to be treated in the wastewater treatment system (m^3/year)

$B_{o,WW}$ Methane producing capacity of the wastewater (kg CH_4 / kg COD)

- **Project emissions due to inefficiencies in capture systems**

(a) Based on the methane emission potential of wastewater and/or sludge:

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

As PP envisage no sludge treatment system in project case for biogas recovery, hence equation simplifies to

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

Where,

$PE_{fugitive,ww,y}$ Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year y (tCO_2e)

$PE_{fugitive,s,y}$ = Fugitive emissions through capture inefficiencies in the anaerobic

sludge treatment systems in the year y (t CO_2e)

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

where:

CFE_{ww}	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems (a value of 0.9 is used, as per AMS-III.H version 19)
$MEP_{ww,treatment,y}$	Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year y (tonne)

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

where:

$Q_{ww,i,y}$	Amount of wastewater to be treated in the wastewater treatment system (m^3/year)
$COD_{removed,PJ,k,y}$	The Chemical Oxygen Demand removed[10] by the treatment system k of the project activity equipped with biogas recovery in the year y (t/m^3)
$MCF_{ww,treatment,PJ,k}$	Methane correction factor for the project wastewater treatment system k equipped with biogas recovery equipment
UF_{PJ}	Model correction factor to account for model uncertainties

(b) Optionally project proponent may take a default value of 0.05m^3 of biogas leaked per m^3 of biogas produced.

- **Project emissions due to incomplete flaring**

Methane emissions that occur due to incomplete flaring will be calculated ex post as per the "Project emissions from flaring (Version 3)".

The calculation procedure in this tool determines the project emissions from flaring the residual gas ($PE_{flare,y}$) based on the flare efficiency ($\eta_{flare,m}$) and the mass flow of methane to the flare ($F_{CH4,RG,m}$). The flare efficiency is determined for each minute m of year y based either on monitored data or default values.

The project emissions calculation procedure is given in the following steps:
(a) STEP 1: Determination of the methane mass flow of the residual gas;
(b) STEP 2: Determination of the flare efficiency;
(c) STEP 3: Calculation of project emissions from flaring.

[10] Calculated based on monitored value as difference between the inflow COD and the outflow COD

Step 1. Determination of the methane mass flow in the residual gas

In the "Project emissions from flaring (Version 3)", the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream (Version 3)” shall be used to determine $F_{CH4,m}$ which is used to determine the mass of methane in kilograms fed to the flare in minute m ($F_{CH4,RG,m}$). $F_{CH4,m}$ shall be determined on a dry basis.

The following requirements apply to use the “tool to determine the mass flow of a greenhouse gas in a gaseous stream”:
(a) The gaseous stream tool shall be applied to the residual gas;
(b) The flow of the gaseous stream shall be measured continuously;
(c) CH_4 is the greenhouse gas i for which the mass flow should be determined;
(d) The simplification offered for calculating the molecular mass of the gaseous stream is valid; and
(e) The time interval t for which mass flow should be averaged is every minute m.

The calculation procedure in this tool determines the project emissions from flaring the residual gas ($PE_{flare,y}$) based on the flare efficiency ($\eta_{flare,m}$) and the mass flow of methane to the flare ($F_{CH4,RG,m}$). The flare efficiency is determined for each minute m of year y based either on monitored data or default values.

According to the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream (Version 3)”, there are six options shown in the below table.

OPTIONS	FLOW OF GASEOUS STREAM	VOLUMETRIC FRACTION
OPTION A	Volume flow - dry basis	Measured on dry basis ($v_{i,t,db}$)
OPTION B	Volume flow - wet basis	Measured on dry basis ($v_{i,t,db}$)
OPTION C	Volume flow - wet basis	Measured on wet basis ($v_{i,t,wb}$)
OPTION D	Mass flow - dry basis	Measured on dry basis ($v_{i,t,db}$)
OPTION E	Mass flow - wet basis	Measured on dry basis ($v_{i,t,db}$)
OPTION F	Mass flow - wet basis	Measured on wet basis ($v_{i,t,wb}$)

As per tool the particular Option from above table can be chosen based on whether residual gas stream is dry or wet.

In case the residual gas stream is wet, it requires determination of absolute humidity of gaseous stream.

Determination of absolute humidity of gaseous stream:
There are two option provided in tool

Option1: **Calculation using measurement of the moisture content**
This option provides a procedure to determine the absolute humidity of the gaseous stream ($m_{H2O,t,db}$) from measurements of the moisture content of the gas

Option2: **Simplified calculation without measurement of the moisture content**

This option provides a simple and conservative approach to determine the absolute humidity by assuming the gaseous stream is dry or saturated depending on which is the conservative situation

The project proponent has chosen option 2, which mentions that

"If it is conservative to assume that the gaseous stream is dry, then $m_{H2O,t,db}$ is assumed to equal 0. If it is conservative to assume that the gaseous stream is saturated, then $m_{H2O,t,db}$ is assumed to equal the saturation absolute humidity ($m_{H2O,t,db,sat}$) and calculated using equation":

$$m_{H2O,t,db,sat} = (P_{H2O,t,Sat} \times MM_{H2O})/((P_t - P_{H2O,t,Sat}) \times MM_{t,db}))$$

Where,

$m_{H2O,t,db,sat}$ = Saturation absolute humidity in time interval t on a dry basis (kg H_2O/kg dry gas)

$P_{H2O,t,Sat}$ = Saturation pressure of H_2O at temperature Tt in time interval t (Pa)

T_t = Temperature of the gaseous stream in time interval t (K)

P_t = Absolute pressure of the gaseous stream in time interval t (Pa)

MM_{H2O} = Molecular mass of H_2O (kg H_2O/kmol H_2O)

$MM_{t,db}$ = Molecular mass of the gaseous stream in a time interval t on a dry basis (kg dry gas/kmol dry gas)

$MM_{t,db}$ is calculated using below equation:

$$MM_{t,db} = \sum_k (v_{k,t,db} \times MM_k)$$

Where,

$v_{k,t,db}$ = Volumetric fraction of gas k in the gaseous stream in time interval t on a dry basis (m^3 gas k/m^3 dry gas)

MM_k = Molecular mass of gas k (kg/kmol)

k = All gases, except H2O, contained in the gaseous stream (e.g. N2, CO2, O2, CO, H2, CH4, N2O, NO, NO2, SO2, SF6 and PFCs). See available simplification below

The determination of the molecular mass of the gaseous stream ($MM_{t,db}$) requires measuring the volumetric fraction of all gases (k) in the gaseous stream. However, as a simplification, the volumetric fraction of only the gases k that are greenhouse gases and are considered in the emission reduction calculation in the underlying methodology must be monitored and the difference to 100% may be considered as pure nitrogen.

Further the tool provides various options of gaseous stream, either Option A or Option B will be applicable to project activity

Option A: To demonstrate that residual gas stream is dry basis, or
Option B: Volumetric flow of the gaseous stream in time interval t on a dry basis ($V_{t,db}$) is determined by converting the measured volumetric flow from wet basis to dry basis

As per technology employed by project activity, the temperature of residual gas stream will be less than 60^0C, hence in line with para 23 (b) of the tool dry basis monitoring is possible, hence project proponent decided to apply Option A.

Option A

Flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. There are two ways to do this:

a) Measure the moisture content of the gaseous stream ($C_{H2O,t,db,n}$) and demonstrate that this is less or equal to 0.05 kg H_2O/m^3 dry gas; or
b) Demonstrate that the temperature of the gaseous stream (T_t) is less than 60ºC (333.15 K) at the flow measurement point.

Project participant will measure temperature of the biogas (Tt) at the flow measurement point and demonstrate that (Tt) is less than 60ºC (333.15 K) at the flow measurement point.

The mass flow of methane is determined as follows:

$$F_{i,t} = V_{t,db} * v_{i,t,db} * \rho_{i,t}$$

Where:

$F_{i,t}$ Mass flow of greenhouse gas i in the gaseous stream in time interval t (kg gas/h)

$V_{t,db}$ Volumetric flow of the gaseous stream in time interval t on a dry basis (m^3 dry gas/h)

$v_{i,t,db}$ Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis (m^3 gas i/m^3 dry gas)

$\rho_{i,t}$ Density of greenhouse gas i in the gaseous stream in time interval t (kg gas i/m^3gas i)

With:

$$\rho_{i,t} = (P_t \times MM_i) / (R_u \times T_t)$$

Where,

P_t = Absolute pressure of the gaseous stream in time interval *t* (Pa)
MM_i = Molecular mass of greenhouse gas *i* (kg/kmol)
R_u= Universal ideal gases constant (Pa.m^3/kmol.K)
T_t = Temperature of the gaseous stream in time interval *t* (K)

Step2. Determination of flare efficiency

As per the flare specifications/39/ provided by PP and the Skype interviews, it has been confirmed that the project will entail enclosed flare of high height. Therefore, a default value of 90% flare efficiency can be used if the flare is detected in an hour and temperature of exhaust gas is measured more than 500 ^{0}C. Otherwise, the default efficiency will be considered as 0%.

Step3. Calculation of project emissions from flaring

$$PE_{flare,y} = GWP_{CH4} \times \sum_{m=1 \text{ to } 525600} F_{CH4,RG,m} \times (1 - \eta_{flare,m}) \times 10^{-3}$$

Where:

$PE_{flare,y}$ Project emissions from flaring of the residual gas in year y (tCO_2e)
GWP_{CH4} Global warming potential of methane valid for the commitment

period (tCO_2e/tCH_4)

$F_{CH4,RG,m}$ Mass flow of methane in the residual gas in the minute m (kg)

$\eta_{flare,m}$ Flare efficiency in minute m

OM_y Operating minutes in year y

$F_{CH4,RG,m} = F_{i,t} / 60 * OM_y$

Where:

$F_{CH4,RG,m}$ = Mass flow of methane in the residual gas in the minute m (kg)

$F_{i,t}$ = Mass flow of greenhouse gas i in the gaseous stream in time interval t (kg gas/h)

OM_y = Operating minutes in year y

However, for ex ante estimation, in accordance with AMS-III.H version 19 equation 8, baseline emission calculation for wastewater treatment (i.e. equation 2 of AMS-III.H) can be used but without the consideration of GWP for CH_4 according to AMS-III.H. Thus, ex ante methane emissions due to incomplete flaring in year y is calculated as follows:

$PE_{Flare,y} = Q_{ww,i,y} * COD_{inflow,i,y} * \eta_{COD,BL,i} * MCF_{ww,treatment,BL.i} * B_{o,ww} * UF_{BL}$

Where:

$Q_{ww,i,y}$ Volume of wastewater treated in baseline wastewater treatment system i in year y (m^3). For ex ante estimation, forecasted wastewater generation volume or the designed capacity of the wastewater treatment facility can be used. However, the ex post emissions reduction calculation shall be based on the actual monitored volume of treated wastewater

$COD_{inflow,i,y}$ Chemical oxygen demand of the wastewater inflow to the baseline treatment system i in year y (t/m^3). Average value may be used through sampling with the confidence/precision level 90/10

$\eta_{COD,BL,i}$ COD removal efficiency of the baseline treatment system i, determined as per the paragraphs 28(2)

$MCF_{ww,treatment,BL.i}$ Methane correction factor for baseline wastewater treatment systems i (MCF values as per Table III.H.2)

i Index for baseline wastewater treatment system

$B_{o,ww}$ Methane producing capacity of the wastewater (IPCC value of 0.25 kg CH_4/kg COD)

UF_{BL} Model correction factor to account for model uncertainties (0.89)

Using the above parameters, the total project emission is estimated as **10,862 tCO_2e/year**.

Validation team assessment: The validation team concludes that the formulas and the steps used in the updated PDD/2/ is consistent with the methodology applied i.e. AMS-III.H, Version 19/11/ and the relevant tools.

Leakage

No leakage is applicable under this methodology which is found acceptable by the

validation team.

Emission Reductions

The emission reduction ER_y by the project activity during a given year y is as follows:

$$ER_{y,ex\ ante} = BE_{y,ex\ ante} – (PE_{y,ex\ ante} + LE_{y,ex\ ante})$$

where:

$ER_{y,ex\ ante}$ Ex-ante emission reduction in year y (tCO_2e)

$BE_{y,ex\ ante}$ Ex-ante baseline emissions in year y (tCO_2e)

$PE_{y,ex\ ante}$ Ex-ante project emissions in year y (tCO_2e)

$LE_{y,ex\ ante}$ Ex-ante leakage emissions in year y (tCO_2e)

Ex post emission reductions shall be determined for case 2(a) and 2(e) as per paragraph 49. For cases 2(b), 2(c), 2(d) and 2(f), ex post emissions reductions shall be based on the lowest value of the following, as per paragraph 44:

i. The amount of biogas recovered and fuelled or flared (MD_y) during the crediting period, that is monitored ex-post.

ii. Ex-post calculated baseline, project and leakage emissions based on actual monitored data for the project activity.

For cases 2(d), it is possible that the project activity involves wastewater systems with higher methane conversion factors (MCF) or with higher efficiency than the treatment systems used in the baseline situation. Therefore the emission reductions achieved by the project activity is limited to the ex-post calculated baseline emissions minus project emissions using actual monitored data for the project activity.

The emission reductions achieved in any year are the lowest value of the following:

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

where:

$ER_{y,ex\ post}$	Emission reductions achieved by the project activity based on monitored values for year y (tCO_2e)
$BE_{y,ex\ post}$	Baseline emissions calculated as per paragraph 27 of AMS-III.H version 19 using ex post monitored values (tCO_2e)
$PE_{y,ex\ post}$	Project emissions calculated as per paragraph 39 of AMS-III.H version 19 using ex post monitored values (tCO_2e)
MD_y	Methane captured and destroyed/gainfully used by the project activity in the year y (tCO_2e)
$LE_{y,ex\ post}$	Leakage as per paragraph 41 of AMS-III.H version 19 (tCO_2e)

	In the case of flaring/combustion MD_y will be calculated as: $MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4}$ Where $BG_{burnt,y}$ Annual volume of biogas burnt in year y (m^3/year) $w_{CH4,y}$ 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/m^3) 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 GWP_{CH4} Global warming potential of methane For case 2(d), the emission reduction achieved by the project activity (ex-post) will be the difference between the baseline emissions and the sum of the project emissions and leakage: $ER_{y\ ex\ ante} = BE_{y\ ex\ ante} – (PE_{y\ ex\ ante} + LE_{y,\ ex\ ante})$ = 69,847 tCO_2e – (10,862 tCO_2e + 0 tCO_2e) = 58,985 tCO_2e The validation team assessed that the methodology allows for selection between options for equations or parameters, and adequate justification has been provided (based on the choice of the baseline scenario, context of the proposed CDM project activity) and that the correct equations and parameters have been used, in accordance with the methodology selected. No methodological tools were applied in the proposed CDM PA. The PDD includes justification for the choice of data and parameters used in the equations.
Findings	Nil
Conclusion	The validation team confirms, based on the description provided above, and the steps taken to assess the requirements that: (a) All assumptions and data used by the project participants are listed in the PDD and/or its annexures, including their references and sources; (b) All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD; (c) All values used in the PDD /02/ including GWPs (no GWP was used) are considered reasonable in the context of the proposed CDM project activity; (d) The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions; (e) All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD and has been done in the corresponding ER sheet Thus the project is meeting the requirement of VVS Version 2.0 /8/.

D.4.8. Monitoring plan

Means of validation	The project activity applies the monitoring methodology AMS-III.H / Version 19.0/11/ for monitoring of emission reduction which is valid. The project activity

meets the entire requirement as stated in the methodology and provided all the parameters in the current version of the PDD in terms of ex-ante and ex-post in the respective section of the PDD i.e. B.6.2 and B.7.1.

(a) Data and parameters fixed ex ante: Following list of data and parameters that will not be monitored throughout the crediting period of the proposed CDM project activity but have already been determined and will remain fixed throughout the crediting period, the validation team assessed that all data sources and assumptions are appropriate and calculations are correct as applicable to the proposed CDM project activity and will result in an accurate or conservative estimate of the emission reductions, as mentioned below;

Parameter	Unit	Value	Assessment Remarks
GWP_{CH4} Global Warming Potential of Methane	tCO_2e/tCH_4	25	The validation team has checked the IPCC value for second commitment period and found to be consistent. Hence, the value is accepted by the validation team.
$B_{o,WW}$ Methane producing capacity of the wastewater	kg CH_4 / kg COD	0.25	The value is a default IPCC value as per the Paragraph 27 of AMS-III.H (version 19) which is found to be consistent by the validation team. Hence, the value is accepted by the validation team.
$\eta_{COD,BL,i}$ COD removal efficiency of the baseline treatment system i	%	92.61	Average of the samplings conducted and analysed by an independent laboratory. Inflow COD is the wastewater entering the anaerobic wastewater treatment system and outflow COD is the “final treated wastewater discharged into sea, river, or lake”. The validation team confirms that the calculation of COD removal efficiency in baseline system is found to be consistent with the supportive/33/.
UF_{BL} Model correction uncertainty factor to account for model uncertainties	-	0.89	The value is a default value as per the Paragraph 27 of AMS-III.H (version 19) which is found to be consistent by the validation team. Hence, the value is accepted by the validation team.
$MCF_{WW,treatme}$	-	0.8	The value is a default value as per the Table-2 of AMS-

	nt,BL,j Methane correction factor for baseline wastewater treatment system i			III.H (version 19) which is found to be consistent by the validation team. Hence, the value is accepted by the validation team.
	$MCF_{WW,treatment,PJ,k}$ Methane correction factor for project wastewater treatment system k	-	0.8	The value is a default value as per the Table 2 of AMS-III.H version 19 or Table 6.8 of Volume 5 Chapter 6 IPCC 2006 Guideline which is found to be consistent by the validation team. Hence, the value is accepted by the validation team.
	$MCF_{WW,PJ,discharge}$ Methane correction factor based on the discharge pathway of the wastewater in the project scenario (e.g. into sea, river or lake or land application)	-	0.1	The value is a default value as per the Table 2 of AMS-III.H version 19 which is found to be consistent by the validation team. Hence, the value is accepted by the validation team.
	UF_{PJ} Model correction to account for model uncertainties	-	1.12	The value is a default value as per the AMS-III.H (version 19) paragraph 40 which is found to be consistent by the validation team. Hence, the value is accepted by the validation team.
	CFE_{WW} Capture efficiency of the biogas recovery equipment in the wastewater treatment systems	-	0.9	The value is a default value as per paragraph 40 of AMS-III.H version 19 which is found to be consistent by the validation team. Hence, the value is accepted by the validation team.

$\eta_{PJ,k,y}$ COD removal efficiency of the project treatment system j	%	85	The value has been verified from the Manufacturer specification/14/ and found to be acceptable by the validation team.
$\eta_{flare,h}$ Flare efficiency in hour h	%	90%, if temperature of exhaust gas is more than 500 ^{0}C in a given hour. 0, otherwise	The value is a Default value for enclosed flaring as per "Project emissions from flaring V03.0". Hence acceptable by the validation team.
$EF_{EL,j,y}$ Emission factor for electricity generation for source j in year y	tCO_2/MWh	1.3	The project activity uses off grid Gas Engine set to meet its electricity requirement, hence as per applied tool Option B is used to determine the value.
$FE_{combusted}$ Flare efficiency of the biogas used for gainful purpose	%	100	The value is a default value as per AMS-III.H (version 19) which is found to be consistent by the validation team. Hence, the value is accepted by the validation team.
$\rho_{CH4,n}$ Density of methane gas at normal conditions.	Kg/m^3	0.716	The value is a default value as per Table-1 of Tool "Project emission from flaring" V03.0 which is found to be consistent by the validation team. Hence, the value is accepted by the validation team.
$SPEC_{flare}$ Manufacturer's flare specifications for temperature, flow rate and maintenance schedule	Temp- ^{0}C Flow rate- m^3/h Maintenance schedule- Year	Temp- 500^{0}C or more Flow rate- 1000 to 13000 m^3/h Maintenance schedule- yearly	The value has been verified from the Manufacturer specification of flare/38/ and found to be acceptable by the validation team.

(b) **Data and parameters to be monitored**: Though, the actual data and parameters will be monitored or estimated on implementation and hence become available only after validation of the proposed CDM project activity, the validation team assessed that the estimates provided in the PDD for these data and parameters are reasonable.

B) Data and parameters monitored:

The data required to be monitored *ex-post* include:

Parameter	Unit	Assessment Remarks
$Q_{ww,l,y}$ Volume of the wastewater treated in the year "y"	m^3	The parameter will be measured by using flow meter at inlet to the project activity wastewater treatment system. Continuous monitoring will be undertaken with at least hourly measurements (if less, then confidence/precision level of 90/10 shall be attained) as verified from the PP, during remote audit interviews. The meter will be operated and calibrated according to manufacturer's specifications (but no less than every 3 years). A calibration/service log will be maintained for each meter. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
$COD_{inflow,l,y}$ Chemical oxygen demand of the wastewater entering the anaerobic treatment/reactor system in the year "y"	Tonnes/m^3	The parameter will be measured according to national or international standards at in- house and/or by an accredited laboratory. A 90/10 confidence/precision level will be ensured for sampling and measurements as verified from the PP, during remote audit interviews. COD will be measured through representative sampling and average value will be used through sampling with 90/10 confidence/precision level /22/. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.

	$COD_{WW,treated,y}$ Chemical oxygen demand of the treated wastewater discharged in the year "y"	Tonnes/m^3	The parameter will be measured according to national or international standards at in- house and/or by an accredited laboratory. A 90/10 confidence/precision level will be ensured for sampling and measurements as verified from the PP, during remote audit interviews. COD will be measured through representative sampling and average value will be used through sampling with 90/10 confidence/precision level /22/. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	$COD_{WW,discharge,y}$ Chemical oxygen demand of the treated wastewater discharged to river/water/lake.	tCOD/m^3	The parameter will be measured according to national or international standards at in- house and/or by an accredited laboratory. A 90/10 confidence/precision level will be ensured for sampling and measurements as verified from the PP, during remote audit interviews. COD will be measured through representative sampling and average value will be used through sampling with 90/10 confidence/precision level /22/. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	$S_{final,PJ,y}$ Amount of dry matter in final sludge	Tonnes	The amount of dry matter in the sludge has been applied as zero for ex- ante but the parameter will be monitored.

			Monitoring of 100 percent of the sludge amount would be undertaken through continuous or batch measurements and moisture content through representative sampling to ensure the 90/10 confidence/precision level /22/, as verified from the PP during remote audit interviews. The total quantity of sludge will be measured on a wet basis. The volume (m^3) and density or direct weighing will be used to determine the sludge amount (wet basis). Representative samples are taken to determine the moisture content to calculate the total sludge amount on dry basis. If the methane emissions from anaerobic decay of the final sludge are to be neglected because the sludge is controlled combusted, disposed of in a landfill with methane recovery, or used for soil application, then the end-use of the final sludge will be monitored during the crediting period. If the baseline emissions include the anaerobic decay of final sludge generated by the baseline treatment systems in a landfill without methane recovery, the baseline disposal site shall be clearly defined, and verified by the DOE. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.	
	$BG_{burnt,y}$ Biogas volume in year y	m^3	The parameter shall be measured using continuous flow meters. Continuous monitoring of the amount of biogas recovered, fuelled, flared or otherwise utilized (e.g. injected into a natural gas distribution grid or distributed via a dedicated piped network) will be undertaken with at	

			least hourly measurements (if less, then confidence/precision level of 90/10 shall be attained). The same has been confirmed from the PP during remote audit interviews. If the biogas streams flared and fuelled (or utilized) are monitored separately, the two fractions would be added together to determine the total biogas recovered, without the need to monitor the recovered biogas before separation. The methane content measurement will be carried out close to the biogas flow meters. Meters will be calibrated as per vendor's specifications or at least once in 3 years, whichever is less. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	w_{CH4} Methane content in biogas in year y	%	The parameter will be measured with a continuous analyser or, alternatively, with periodical measurements at least once a month. It will be 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 would be carried out close to a location in the system where a biogas flow measurement takes place. Continuous monitoring will be undertaken and the analyser used will be calibrated periodically as per vendor's specifications or at least once in 3 years, whichever is less as verified from the remote audit interviews.

			Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	T Temperature of the biogas	^{0}C	The parameter will be monitored continuously using biogas flow meter and at the same time when methane content in biogas ($w_{CH4,y}$) is measured, as verified from the remote audit interviews. Temperature of the biogas is required to determine the density of the methane combusted. Since, the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas. The flow meter used will be calibrated periodically as per vendor's specifications or at least once in 3 years, whichever is less. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	P Pressure of the biogas	Pa	The parameter will be monitored continuously using biogas flow meter and at the same time when methane content in biogas ($w_{CH4,y}$) is measured, as verified from the PP during remote audit interviews. Pressure of the biogas is required to determine the density of the methane combusted. Since, the biogas flow meter employed measures flow, pressure and temperature and

			displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas. Continuous monitoring will be undertaken and the flow meter used will be calibrated periodically as per vendor's specifications or at least once in 3 years, whichever is less. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	$EC_{PJ,I,y}$ Quantity of electricity that would be consumed by the project electricity consumption source j in year y	MWh/yr	The parameter would be monitored using an electricity meter. Continuous monitoring will be undertaken and would be aggregated on monthly basis, as verified from the remote audit interviews. The accuracy and class of the meter used will be as per industry standard and it will be calibrated periodically as per manufacturer's recommendation or at least once in 3 years, whichever is less. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	BG_{Flare} Amount of biogas recovered and directed to flare for combustion	Nm^3	The parameter will be monitored using a flow meter. Continuous monitoring and monthly recording (dry basis) will be undertaken, as verified from the remote audit interviews. An internal QA audit process will ensure that monitoring activities are conducted in accordance with the monitoring plan

			and data is accurately reported. The meter will be operated and calibrated according to manufacturer's specifications. A calibration/service log will be maintained for each meter. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	$BG_{combusted}$ Amount of biogas recovered and directed to boiler/ Gas Engine set for combustion	Nm^3	The parameter will be monitored using a flow meter. Continuous monitoring and monthly recording (dry basis) will be undertaken, as verified from the remote audit interviews. An internal QA audit process will ensure that monitoring activities are conducted in accordance with the monitoring plan and data is accurately reported. The meter will be operated and calibrated according to manufacturer's specifications. A calibration/service log will be maintained for each meter. Electronic data will be archived within the crediting period and 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	vi,t,db Volumetric fraction of component i in the residual gas in the minute m where i = CH_4	m3 of gas i/m3 dry gas	The parameter will be measured with a continuous analyser or, alternatively, with periodical measurements at least once a month, as verified from the remote audit interviews. It will be 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 CO_2 is not permitted. The methane content measurement

			would be carried out close to a location in the system where a biogas flow measurement takes place. The measurement equipment will be periodically calibrated according to the manufacturer's recommendation or once every 3 years, whichever is less. A zero check and a typical value check may be performed by comparison with a standard certified gas. Electronic data will be archived within the crediting period and kept for minimum of 2 years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	$V_{t,db}$ Volumetric flow rate of the residual gas in dry basis at normal conditions in the minute m	m^3	The parameter will be monitored on continuous basis. Values will be averaged hourly or at a shorter time interval, using flow meter. Both measurements (flow rate of the residual gas and volumetric fraction of methane in the residual gas) will be taken with the same reference condition that may be dry or wet basis. If the residual gas moisture is significant (temperature greater than 60^oC), the measured flow rate of the residual gas will be corrected to dry basis. The accuracy and class of the meter will be as per applicable industry standard. The measurement equipment will be periodically calibrated according to the manufacturer's recommendation or once every 3 years, whichever is less. Electronic data will be archived within the crediting period and kept for minimum of 2 years after the end of

			the crediting period or the last issuance of CERs for the project activity, whichever occurs later. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	$\eta_{flare,h}$ Flare efficiency in hour h based on measurements or default values.	Percentage	The parameter will be measured by the project participants as verified from the remote audit interviews, it includes all data and parameters that are required to monitor whether the flare operates within the range of operating conditions according to the manufacturer's specifications including a flame detector in case of open flares. Electronic data will be archived within the crediting period and kept for minimum of 2 years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.
	$Flame_m$ Flame detection of flare in the minute m	Flame on or Flame off	The parameter will be measured once per minute using a fixed installation optical flame detector: Ultra Violet detector or Infra-Red or both, as verified from the remote audit interviews. The measurement equipment will be periodically calibrated according to the manufacturer's recommendation or once every 3 years, whichever is less. Electronic data will be archived within the crediting period and kept for minimum of 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and

		the project participant is able to implement the monitoring plan.
$T_{EG,m}$ Temperature in the exhaust gas of the enclosed flare in minute m	^0C	The parameter will be measured once per minute suing Temperature measurement equipment, as verified from the remote audit interviews. The equipment will be calibrated once in 3 years or as per manufacturer specifications. Unexpected changes such as a sudden increase/drop in temperature can occur for different reasons. These events shall be noted in the site records along with any corrective action that was implemented to correct the issue during the verification. Electronic data will be archived within the crediting period and kept for minimum of 2 years after the end of the crediting period. Hence, validation team can conclude that the monitoring plan is complying with the applied methodologies and the project participant is able to implement the monitoring plan.

All the monitoring parameters have been mentioned in section B.7.1 of the PDD. The validation team has verified the values used against the sources and conclude that all relevant parameters to calculate the GHG emissions reductions of the project have been sufficiently considered and the value of the *ex-ante* fixed parameter used for emission reduction calculation has been determined conservatively and the estimation *ex-post* parameters are reasonable. The validation team considers that the monitoring plan has complied with the requirements in the approved methodology thereby satisfying VVS V2 /8/.

Steps undertaken to assess the monitoring plan:

Compliance of the monitoring plan with the approved methodology -

According to the PDD, the project's monitoring plan outlines the followings:-

- Monitoring parameters: the monitoring parameters of the project are listed above as "Parameters monitored ex-post".
- Operational and management structure: management structure is illustrated for the CDM project monitoring, responsibilities of personnel for recording and cross verification for the monitored parameter;
- Monitoring Equipment's, frequency of monitoring / measurement / recording of each parameter, frequency of calibration, accuracy of measurements;
- Quality Control and Data Archive: Verification of data monitored (consistency and completeness), Ensuring adequate training of staff, Ensuring adequate maintenance, Ensuring calibration of monitoring instruments, Data archiving: ensuring adequate storage of data monitored (integrity and backup), Identification of non-conformance and corrective/preventive actions and

	monitoring plan improvement and Emergency procedures. All of these parameters are recorded in the plant log book. **Management System and Quality Assurance:** Detailed responsibilities and authorities for project management, monitoring procedures, calibration procedures and QA/QC procedures have been presented and were verified during follow up interviews. The detailed monitoring practice is considered appropriate and the implementation of these will enable subsequent verification of the project's emission reductions. **Implementation of the plan:** According to document review in the PDD and remote audit interviews with the representatives of the PP, detailed monitoring procedures, monitoring structure, management team, monitoring items and functions are clearly demonstrated in the PDD which will enable subsequent verification of the project's emission reductions in line with the applied methodology /11/. The validation team confirms that the monitoring procedure and frequency of all the monitoring parameters complies with the requirement of the applied methodology. The specific uncertainty levels, methods and associated accuracy level of measurement instruments and calibration procedures used for various parameters and variables are identified in the PDD/02/, along with detailed quality assurance and quality control procedures. All the monitored data will be archived until 2 years or the last issuance of CERs whichever occurs later after the crediting period to facilitate crosschecking during the crediting period. Moreover, the PP will provide appropriate training prior to the project operation for the management team and operation team in order for ensuring that they are suitable and competent for carrying out the work. Hence, the validation team considers that the PP is capable to implement the monitoring plan. **Implementation of the sampling plan:** The COD value of inflow wastewater, treated wastewater and wastewater discharged (if applicable) will be determined based on sampling procedures as outlined below. The PP will be responsible for conducting the sampling of wastewater and maintaining the records /22/. PP will conduct sampling as per the Guideline for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 04. Representative sample size will be taken to ensure at least 90/10 confidence/precision level requirement. The project activity will follow the "Best Practice Examples Focusing on Sample Size and Reliability Calculations" (hereinafter referred to as "Best Practice Examples") for determining the number of COD samples to be taken in order to ensure 90/10 confidence precision level. The PP will follow the relevant guidance applicable to "Measurement in Biogas Projects" from clause 97 through clause 108 of the best practice examples /22/. Random COD samples will be taken over a campaign period of 10 days at the start of any monitoring period for obtaining the COD values.
Findings	CL 01, CL 02 and CAR 08 were raised and closed satisfactorily. Refer to appendix 4 for further details.
Conclusion	The validation team confirms that:

	(a) All the values used from official sources and the authenticity of sources has been verified by the validation team and confirms that all relevant parameters to calculate the GHG emissions reductions of the project have been sufficiently considered and the value of the ex-ante fixed parameter used for emission reduction calculation has been determined conservatively and the estimation of ex-post parameters are reasonable. The validation team considers that the monitoring plan has complied with the requirements in the approved methodology thereby satisfying §118 of VVS, V2 /08/. (b) The monitoring plan based on the approved monitoring methodology, AMS-III.H, version 19 is included in Section B.7 of the PDD and is correctly applied to the CDM project activity. The monitoring plan has been found to be in compliance with the requirements of the applied methodology. The monitoring plan will give opportunity for real measurements of achieved emission reductions. (c) The validation team considers that monitoring arrangements described in the monitoring plan is feasible within the project design and the PP will be capable to implement the monitoring plan.

D.5. Start date, crediting period type and duration

Means of validation	The fixed crediting period of 10 years has been opted by PP, the length of the crediting period is less than the technical lifetime of project activity. The technical lifetime is validated in the additionality section as 20 years. The start date of crediting period is 15/12/2020. Also, the start date of the project activity is 02/11/2020 i.e. the date of placing EPC contract /42/ for biogas plant. Validation team confirms that no real action occurred prior to start date.
Findings	No findings were raised.
Conclusion	Validation team confirms that the project activity comply the requirements of para 85-91 of CDM PS, version 02.

D.6. Environmental impacts

Means of validation	The proposed project activity i.e. POME treatment using bio-digester and capture of methane for energy generation does not require separate EIA as verified, during the remote audit interviews, by the validation team. However, PP has willingly implemented an environment management program based on the analysis of Environmental Impact (“AMDAL”) /36/, which has been poured into Environmental management Plan (“RKL”) /36/ and Environmental Monitoring Plan (“RPL”) /36/. This Environmental Monitoring Plan (“RPL”) document contains the environmental monitoring efforts to the major and important impacts arising from the activities of plantation and palm oil processing mill of PT. Tintin Boyok Sawit Makmur, starting from the pre-construction phase, construction phase, operation phase up to the post-operation phase. Further, in the statement letter of (“AMDAL”) /36/, PP has declared that in case of failure to conduct the environmental management activities in accordance with the instructions of the RKL and RPL, PP will willingly discontinue operational activities of the plantation and palm oil processing mill and fulfil any obligations in accordance with the prevailing regulations. As confirmed from the above mentioned documents /36/, the project activity does not result in any negative impacts on environment. It results in no emission of GHGs. Assessment team using its sectoral expertise, concluded that the host party i.e. Indonesia does not require prior environmental clearance for treatment of wastewater based projects. PDD section D.1 is in line with this requirement.
Findings	Nil
Conclusion	In line with above discussions of validation team confirms that there is no mandatory requirement to conduct the EIA for the proposed CDM project activity in

	the host Party. The project activity is in compliance with requirement of VVS V2 /8/.

D.7. Local stakeholder consultation

Means of validation	A local stakeholders' meeting was carried out by the project participant on 09/04/2020/37/, which was prior to the publication of PDD on the UNFCCC website (i.e. 23/04/2020). The validation team noted that all the relevant stakeholders were identified are in line with the definition of stakeholders as per latest version of CDM Glossary of terms. The local stakeholders identified by the PP were the villagers, and workers on the project site who will be affected by the project activity. The PP has utilized appropriate media to invite these stakeholders. Stakeholders were invited through 3 leading newspapers named The Jakarta post, Pontianak post and Tribun Pontianak dated 02/04/2020. The personal invitation letter was also send to nearby villagers with venue and time detail on 30/03/2020 as verified by the validation team through supportive /31/. Stakeholders were directly asked to provide their feedback on the project through an open meeting conducted on 09/04/2020 on the project site. A summary of the comments received and a note on how due account was taken of the concerns raised in the meeting are included in sections E.2 and E.3 of the PDD/2/.
Findings	No Findings were raised.
Conclusion	The validation team have verified all relevant documents of local stakeholder consultation meeting and conducted interview with the stakeholders available at the time of remote audit. It concludes that the project participant conducted the stakeholders' consultation process in transparent and unbiased manner. The validation team confirms that the LSC meeting meets to the requirements of §130-137 of VVS V2 /8/ that the process for conducting the local stakeholders meeting is adequate and credible.

D.8. Sustainable development co-benefits

Means of validation	Not applicable.
Findings	Not applicable.
Conclusion	Not applicable.

D.9. Approval

Means of validation	The project activity is a unilateral CDM project, which involves project participant, i.e. 'PT. Tintin Boyok Sawit Makmur' from host party, Indonesia. KBS confirms that it has entered into a contractual agreement with 'PT. Tintin Boyok Sawit Makmur' for performing the validation. The host party for the project activity is Indonesia, which has ratified the Kyoto Protocol on 26/08/2002. The Designated National Authority (DNA) is the Ministry of Environment & Forestry for Indonesia. The DNA of Indonesia has issued a Letter of approval, Letter No. S.307/PPL/MSQR/KLN.0/10/2020 (LoA) dated 26/10/2020/5/ for the project activity. The information of the DNA has been confirmed by the validation team against the relevant information on the UNFCCC CDM website (http://cdm.unfccc.int/DNA/index.html) The table given below summarizes the project participant(s) and party (ies) involved.

Project participant (s)	PT. Tintin Boyok Sawit Makmur
Part(ies) involved	Indonesia (Host)
Project activity title	Methane capture project

	Approval	Yes
	LoA received	Yes
	Date of LoA	26/10/2020
	Reference of document	S.307/PPL/MSQR/KLN.0/10/2020
	LoA received from	Project Participant
	Validation of authenticity	The assessment team has reviewed other LoAs issued by the DNA of Indonesia and confirmed the authenticity of signature and content of the LoA. The assessment team does not doubt the authenticity of the LoA.
	Validity of LoA	Valid
	Authorization -	
	Party is party to Kyoto Protocol	Yes. Indonesia ratified the Kyoto protocol on 26/08/2002
	Voluntary participation	Yes, as confirmed in LoA.
	Diversion of official development aid towards host country	No, there is no Annex I country involved.
	Project contribution to sustainable development	Yes, as confirmed in LoA.
Findings	CAR 01 has been raised. Refer to appendix 4 for further details.	
Conclusion	The LoA was reviewed and confirmed the following: • India is a party to the Kyoto protocol; • CDM is a voluntary participation; • The project under validation will contribute to the sustainable development of India; • The project title is in line with the title mentioned under section A.1 of the PDD. LoA/5/ has been verified to be unconditional with respect to all the above confirmed aspects. The validation team has confirmed that the LoA has met the requirements of §139-146 of the VVS V2/8/. The validation of approval has been done on the basis of § 139-146 of VVS V2/8/ and validation team confirms that the proposed project activity meets the requirement of § 146 of VVS V2/8/.	

D.10. Authorization

Means of validation	The host Party for the proposed project activity is Indonesia, fulfils the participation requirements, having ratified the Kyoto Protocol on the 26/08/2002 and established National Clean development Mechanism Authority, Ministry of Environment and Forestry, as its DNA. This has been confirmed from the link (https://cdm.unfccc.int/DNA/DNA/view.html?CID=102) The project participant listed in the section A.4 of the PDD/2/ is PT. Tintin Boyok Sawit Makmur in the proposed CDM project activity.
Findings	CAR 01 has been raised. Refer to appendix 4 for further details.
Conclusion	The validation team confirms participation of PT. Tintin Boyok Sawit Makmur in the project activity has been approved by DNA of Indonesia, which is a Party to the Kyoto Protocol. The validation team confirms that, a) The participation of project participant has been approved/ authorized by the

	DNA of host Party (Indonesia) b) The participation has been confirmed in the LoAs itself, which contains the name of the PP to which it is issued c) The information is consistent within the project documentation viz., PDD, LoA/5/ and signed MoC/6/. The validation of authorization has been done on the basis of § 147-151 of VVS V2 and validation team confirms that the proposed project activity meets the requirement of § 151 of VVS V2/8/.

D.11. Modalities of communication

Means of validation	The modalities of communication (MoC) for the given project activity, signed on 30/10/2020/6/ was received from PP. As required in procedures for Modalities of Communication between project participants and the Executive Board, the validation team has verified that the name of Ms. Aram Lee, Senior manager as primary signatory of PT. Tintin Boyok Sawit Makmur and the name of Mr. Jin Hwan Kim, as primary signatory of LG International Corp. A joint focal point authority has been provided in the MoC consisting of the entities, PT. Tintin Boyok Sawit Makmur and LG International Corp. The corporate identity/41/ of authorized signatory in the Modalities of Communication (MoC) statement, as well as the personal identities, including specimen signatures and employment status, is validated by assessment team through the letter of identity submitted by PT. Tintin Boyok Sawit Makmur dated 10/11/2020 /41/. Therefore, it is in compliance with para 153 (C) of the VVS, version 02 for CDM project activities/8/. The validation team confirms that the MoC statement is received from the project participant with whom KBS has contractual relationship/47/ which is in compliance with para 154 of the VVS, version 02 for CDM project activities/8/. Further, the validation team confirms that the signatory and contact details on the MoC are authorized and credible. The information required as per the F-CDM-MOC, including its annex 1, is correctly completed. The validation team was also able to check that MoC was prepared using latest version of MoC form available on UNFCCC website i.e. Version-03. The project participant's authorized signatories signing the F-CDM-MOC correspond to the project participant's authorized signatories included in F-CDM-MOC, annex 1.
Findings	CAR 01 has been raised. Refer to appendix 4 for further details.
Conclusion	The assessment shall confirm that: (a) It has performed due diligence on the MoC statement in accordance with the requirements established in VVS V02 for CDM project activities/08/. (b) The MoC statement complies with all relevant forms and requirements. The validation of MoC/6/ has been done on the basis of § 152-157 of VVS V2 and validation team confirms that the proposed project activity meets the requirement of VVS, version 02 for CDM project activities/8/.

D.12. Global stakeholder consultation

Means of validation	The Project Design Document for this project was made available on *(*https://cdm.unfccc.int/Projects/Validation/DB/80LUR75RNDBTY9NRQPJKTI62DILG9A/view.html *)* for comments from 23/04/2020 to 22/05/2020 in accordance with the CDM PCP, version 02.
Findings	Nil

Conclusion	No comments received.

SECTION E. Internal quality control

>> Following the completion of the assessment process and a recommendation by the assessment team, the validation opinion prepared by Team Leader is independently reviewed by internal Technical Reviewer (TR). TR reviews if all the KBS procedures have been followed and all conclusions are justified in accordance with applicable standards, procedures, guidance and CDM decisions. The TR either is qualified for the technical area within the CDM sectoral scope(s) applicable to project activity or is supported by qualified independent technical expert at this stage.

The Technical Reviewer will either accept or reject the recommendation made by the assessment team. The findings can be raised at this stage and PP must resolve them within agreed timeline.

The opinion recommended by Technical Reviewer will be confirmed by Manager Technical & Certification and finally authorized by the Managing Director on behalf of KBS as final validation opinion. The Technical Reviewer and Manager T&C maybe be same person.

SECTION F. Validation opinion

>> KBS Certification Services Pvt. Ltd. has been contracted by 'PT. Tintin Boyok Sawit Makmur' to perform a validation of the project:

Project title: Methane capture project[11]

Host Party: Indonesia

The validation was performed in accordance with the UNFCCC criteria for the Clean Development Mechanism, latest version of Validation and Verification Standard and related Standards/Guidance and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The proposed CDM project activity will result in reductions of greenhouse gas (GHG) emissions that are real, measurable and give long-term benefits to the mitigation of climate change. In our opinion, the project meets all relevant UNFCCC, CDM criteria and all relevant host country criteria.

The project correctly applies methodology AMS-III.H, Version 19.0. It is demonstrated that the project is not a likely baseline scenario. The emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be 589,850 tCO_2e over 10 years of fixed crediting period during 15/12/2020 to 14/12/2030, averaging 58,985 tCO_2e annually. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achievable given the underlying assumptions do not change.

The project will hence be recommended by KBS for request for registration with the UNFCCC.

[11] The title of the project has been revised from the webhosted PDD in accordance with the LoA issued from DNA, however, the project activity is same. Refer to Appendix-4 (CAR 10) for further details.

Appendix 1. Abbreviations

Abbreviations	Full texts
ACM	Approved Consolidated Methodology
APERC	Andhra Pradesh Electricity Regulatory Commission
BE	Baseline Emissions
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CERC	Central Electricity Regulatory Authority
CM	Combined Margin
CER	Certified Emission Reduction
CL	Clarification request
COP	Conference of Parties
DISCOM	Distribution Company
DOE	Designated Operational Entity
DNA	Designated National Authority
DR	Document Review
EB	Executive Board
EF	Emission Factor
ERs	Emission Reductions
FAR	Forward Action Request
GBI	Grid Based Incentives
GHG	Greenhouse gas(es)
GSC	Global Stakeholder Consultation
HCA	Host Country Approval
JKLCL	JK Lakshmi Cement Limited
KP	Kyoto Protocol
LSC	Local Stakeholder Consultation
LE	Leakage Emissions
LoA	Letter of Approval/Authorization
ISO	International Organization for Standardization
MOP	Meeting of Parties
MoC	Modalities of Communication
MoV	Means of Verification
MP	Monitoring Plan
OM	Operating Margin
PA	Project Activity
PDD	Project Design Document
PE	Project Emissions
PLF	Plant Load Factor
PP	Project Participant
PPA	Power Purchase Agreement
PS	Project Standard
PO	Purchase Order
PCP	Project Cycle Procedure
QA/QC	Quality Assurance/Quality Control
RfR	Request for Registration
SD	Sustainable Development
T&C	Technical & Certification
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation & Verification Standard
WECM	Waste Energy Carrying Medium

Appendix 2. Competence of team members and technical reviewers

Personnel Name:		Sanjay Kandari	
Qualified to work as:			
Team Leader	☒	Technical Expert	☒
Validator/Verifier	☒	Financial Expert	☒
Technical Reviewer	☒	Local Expert (India)	☒
Area(s) of Technical Expertise			
Sectoral Scope	**Technical Area**		
Energy Industries (renewable/non-renewable sources)	TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar		
Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources		
Energy demand	TA 3.1. Energy Demand		
Waste Handling and Disposal	TA 13.1 Waste Handling and Disposal TA 13.2 Manure		
Approved by (Manager C & T)	Akhilesh Joshi		
Approval date:	11/12/2015		

Personnel Name:		Rohit Badaya	
Qualified to work as:			
Team Leader	☒	Technical Expert	☒
Validator/Verifier	☒	Financial Expert	☒
Technical Reviewer	☒	Local Expert (India)	☒
Area(s) of Technical Expertise			
Sectoral Scope	**Technical Area**		
Energy industries (renewable/non-renewable sources)	TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar		
	TA 1.2: Energy generation from renewable energy sources		
Energy distribution	TA 2.1: Energy distribution		
Energy demand	TA 3.1. Energy Demand		
Waste Handling and Disposal	TA 13.1 Solid waste and wastewater TA 13.2 Manure		
Approved By	Manager Competency & Training		
Approval date:	29/12/2018		

Personnel Name:		Shikha Sharma	
Qualified to work as:			
Team Leader	☐	Technical Expert	☐
Validator/Verifier	☒	Financial Expert	☐
Technical Reviewer	☐	Local Expert	☐

Area(s) of Technical Expertise	
Sectoral Scope	**Technical Area**
-	-
Approved by (Manager C & T)	Sanjay Kandari
Approval date:	26/11/2019

Personnel Name:		**Ms. Yenni Sembiring**	
Qualified to work as:			
Team Leader	☐	Technical Expert	☐
Validator/Verifier	☐	Financial Expert	☐
Technical Reviewer	☐	Local Expert (Indonesia)	☒
Area(s) of Technical Expertise			
Sectoral Scope		**Technical Area**	
-		-	
Approved by (Manager C & T)		Gagandeep Kakkar	
Approval date:		31/12/2014	

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1.	Project Participant	PDD Version 01.0 (Publicly available for global stakeholder consultation)	Dated 22/04/2020	Project Participant
2.	Project Participant	Final PDD Version 03	Dated 05/11/2020	Project Participant
3.	Project Participant	IRR and ER spread sheet	Corresponding to initial PDD	Project Participant
4.	Project Participant	IRR and ER spread sheet	Corresponding to Final PDD	Project Participant
5.	Ministry of Environment and Forestry	Letter of Approval issued by Directorate General of climate Change	No. S.307/PPL/MSQR/KLN.0/10/2020 Dated 26/10/2020	Project Participant
6.	Project Participant	Modalities of Communication	Dated 30/10/2020	Project Participant
7.	Project Participant	Demonstration of additionality of small scale project activity	Version 13.0	Project Participant
8.	UNFCCC	CDM VVS	Version 2.0	UNFCCC Website
9.	UNFCCC	CDM PS	Version 2.0	UNFCCC Website
10.	UNFCCC	CDM PCP	Version 2.0	UNFCCC Website
11.	UNFCCC	Methodology: "AMS-III.H- Methane recovery in wastewater treatment, Version-19, EB 103, Annex-08	Version-19	UNFCCC Website
12.	UNFCCC	Applied Tools: Project emissions from flaring Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation Tool to determine the mass flow of a	Version 03.0 Version 03.0	UNFCCC Website

		greenhouse gas in a gaseous stream	Version 03.0	
13.	UNFCCC	Guidance used: Glossary of CDM Term Guidelines on the assessment of investment analysis	version 10 version 07, EB 92, Annex 05	UNFCCC Website
14.	Project Participant	Technical specifications of anaerobic digester system (ZPHB reactor)	-	Project Participant
15.	Government body	Ministerial Regulation of Environment number 5/2014 about Waste Water Quality Standards	-	Project Participant
16.	Project Participant	Prior consideration form (through email to UNFCCC and DNA)	Dated 16/03/2020	Project Participant
17.	Project Participant	Offer letter by technology supplier (KIS) for the wastewater treatment project dated 01/02/2020	dated 01/02/2020	Project Participant
18.	Project Participant	Offer letter for EPC for the project dated 01/02/2020	dated 01/02/2020	Project Participant
19.	Project Participant	Organizational chart showing operational and management structure	-	Project Participant
20.	Project Participant	Training documents/records	-	Project Participant
21.	Project Participant	Production manual	-	Project Participant
22.	Project Participant	Sampling protocol	-	Project Participant
23.	Project Participant	No ODA funding declaration	Dated 01/06/2020	Project Participant
24.	Project Participant	Supportive for capacity of the anaerobic digester	-	Project Participant
25.	Project Participant	Single line diagram	-	Project Participant
26.	Project Participant	Third-party report for COD removal efficiency of the	-	Project Participant

		baseline treatment system		
27.	Project Participant	Supportive document for the efficiency anaerobic digester system (ZPHB reactor)/ COD removal efficiency of the project treatment system	-	Project Participant
28.	Project Participant	Regulatory approvals	-	Project Participant
29.	Project Participant	Main report analysis on environmental impact "PLANTATION AND PALM OIL PROCESSING MILL" (AMDAL)	September 2008	Project Participant
30.	Project Participant	Confirmation regarding double counting	-	Project Participant
31.	Project Participant	Local stakeholder consultation documents- Attendance sheet, MoM, Invitation letter etc.	Dated 09/04/2020	Project Participant
32.	Project Participant	Copy of investment decision	Dated 15/02/2020	Project Participant
33.	PT. Tintin Boyok Sawit Makmur	PT.TBSM Internal testing POME COD data	Dated 31/03/2020	Project Participant
34.	PT. Tintin Boyok Sawit Makmur	TBSM PKS Selling Contract	Dated 07/04/2020	Project Participant
35.	PT. Tintin Boyok Sawit Makmur	TBSM Diesel Purchase Price	P/O dated 2019/12/18	Project Participant
36.	PT. Tintin Boyok Sawit Makmur	AMDAL_TBSM (ENVIRONMENTAL IMPACT ANALYSIS PLANTATION AND PALM OIL PROCESSING MILL) Environmental Management Plan "RKL" Environmental Monitoring Plan "RPL"	Approval dated 24/10/2008 Approval dated 05/01/2010 Approval dated 24/10/2008	Project Participant
37.	PT. Tintin Boyok Sawit Makmur	Memorandum of Understanding Amendment to MoU	Dated 16/03/2/020 Dated 24/04/2020	Project Participant

38.	Project Participant	Flare data sheet And enclosed flare diagram	-	Project Participant
39.	IPCC	IPCC 2006 guidelines	-	Publicly available
40.	International Journal of Applied Engineering Research ISSN	Research paper titled "Techno-Economic Analysis of Biogas Power Plant from POME (Palm Oil Mill Effluent"	Volume 13, Number 8 (2018) pp. 6151-6157	Publicly available
41.	PT. Tintin Boyok Sawit Makmur	Letter of identity for PT TBSM	Reference: 002/GMO-TBSM/V/2020 Dated 10/11/2020	Project Participant
42.	PT. Tintin Boyok Sawit Makmur and Knowledge integration Services (Singapore) Pte Ltd and PT. KIS Green Technology Projects	EPC Contract of 1 MW biogas power plant.	Dated 02/11/2020	Project Participant
43.	Climate data	https://en.climate-data.org/asia/indonesia/west-kalimantan/kalimantan-590136/	-	Project Participant
44.	National Small Flows Claringhouse	*Lagoons Need Proper Operation, Maintenance.* PIPELINE – Spring 1997; Vol. 8, No. 2. http://www.nesc.wvu.edu/pdf/WW/publications/pipline/PL_SP97.pdf	1997	Project Participant
45.	PT Fasela	Quotation from PT Fasela March 2020	25th March 2020	Project Participant
46.	Deloitte	Income Tax Law 36 of 2008 https://www2.deloitte.com/content/dam/Deloitte/id/Documents/tax/id-tax-indonesian-tax-guide-2019-2020-en.pdf		Project Participant
47.	Project Participant	Email conversation between KBS and PP regarding MoC submission.	Dated 30/10/2020	Project Participant

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CLs from this validation

CL ID	01	**Section no.**	-	**Date:** 22/05/2020
Description of CL				
Following documents needs to be furnished for further validation process: 1. Technical specifications of anaerobic digester system (ZPHB reactor) 2. Supportive for capacity of the anaerobic digester 3. Offer letter by technology supplier (KIS) for the wastewater treatment project dated 01/2/2020 4. Letter of declaration by PP for no use of ODA 5. Offer letter for EPC for the project dated 01/02/2020 6. English version of ADDENDUM AMDAL - PAM.pdf and AMDAL, RKL, RPL - PAM.pdf supportive provided by PP. 7. EPC Contract to check actual cost.				
Project participant response				**Date:** 06/06/2020
The supportive evidence as required is provided along with this response.				
Documentation provided by project participant				
1. Technical specification including capacity *2. Offer letter dated 01/02/2020* *3. Letter of declaration on no use of ODA* *4. English translation of supportive*				
DOE assessment				**Date:** 06/11/2020
1. The technical specifications of digester has been submitted and found to be consistent with the submitted PDD. 2. The supportive for capacity has been submitted and found to be consistent with the submitted PDD. 3. CDM techno commercial proposal/offer letter dated 01/02/2020 has been submitted. 4. Letter of declaration by PP for no use of ODA has been submitted and it can be confirmed that no ODA has been diverted by the project activity which is found to be consistent with the submitted PDD. 5. Offer letter for EPC is the same as Offer letter by technology supplier dated 01/02/2020, which has been submitted. 6. Main report analysis on environmental impact (AMDAL) and addendum of environmental impact analysis has been provided by PP and found to be consistent. 7. EPC contract of 1 MW biogas engine is placed on 02/11/2020 and submitted to validation team, the EPC contract date is the date of start date of project activity and validated in main sections of validation report. Hence, CL 01 is closed.				

CL ID	02	**Section no.**	-	**Date:** 22/05/2020
Description of CL				

1. Under section B.7.1 of the PDD, for the monitoring parameters "**$COD_{inflow,l,y}$**", "**$COD_{WW,treated,y}$**" and "**$COD_{WW,discharge,y}$**", the monitoring frequency, equipment type and its QA/Qc procedures are not clear. As per the interviews, it was mentioned that daily monitoring will be done and a Spectrophotometer will be used. Also, Provide technical details of the equipment used. 2. It is not clear from the PDD whether the enclosed flare is high height or low height; moreover the technical specification of flare shall be included as ex-ante parameters, which are missing in the published PDD. 3. Temperature above 500 degree centigrade is included in the PDD for calculating ERs from flare however the corresponding flow rate shall also be part of monitoring plan. Refer the flaring tool for detailed requirements.
Project participant response **Date:** 06/06/2020
1. As per applied methodology and sampling guideline the frequency of monitoring/sampling will be calculated at start of monitoring period based on campaign of COD parameters. The PP will ensure compliance to sampling requirement i.e. minimum number of sampling or more than that. PP has calculated sample size based on 10 days measurement campaign which comes 6 sample for COD inflow and 9 for COD treated. 2. The enclosed flare is high height as per definition provided in tool. The specification of enclosed flare is incorporated in revised PDD. The height of flare is 10 meters. 3. The flow rate will be monitoring is integrated part of the enclosed flare the same is monitored as volume sent to flare.
Documentation provided by project participant
PDD Version-02
DOE assessment **Date:** 30/06/2020
1. The justification provided by PP is found acceptable and is consistent with the sampling plan mentioned in the section B.7.2, which was also confirmed in the discussion carried out during the remote interview. 2. The specification of enclosed flare has been mentioned in the revised PDD and found consistent with the supportive. 3. The justification provided by PP is found acceptable. Hence, CL 02 is closed.

CL ID	03	**Section no.**	-	**Date:** 22/05/2020
Description of CL				
Under section B.5 of the PDD, PP has mentioned that the date of investment decision is 15/02/2020. But as per the supportive of investment decision, the date has been mentioned as 13/03/2020. Please clarify.				
Project participant response				**Date:** 06/06/2020
There was typo error the same has been corrected in revised PDD as 13/03/2020.				
Documentation provided by project participant				
Letter of investment decision dated 13/03/2020 *PDD Version-02*				
DOE assessment				**Date:** 30/06/2020
Validation team has checked the Letter of investment decision dated 13/03/2020 and confirms that the date of investment decision has now been corrected accordingly in section B.5 of the revised PDD. Hence, CL 03 is closed.				

CL ID	04	**Section no.**	-	**Date:** 22/05/2020
Description of CL				

Section B.5

1. PP shall clarify whether project/PP are enjoying any tax benefits from the project activity.
2. Costs saving from the diesel and PKS as cash inflows have not been subjected to any escalation throughout the crediting period. Reasoning/rationale behind this shall be provided.
3. Fair value/salvage value at the end of project lifetime is not considered in cash investment analysis. Clarify how the requirements of guidance 6 of 'Investment Analysis' tool met.
4. Fuel saving cost is punched in IRR spread sheet; PP shall submit the evidence for the same.
5. Information provided for the benchmark is contradictory, page 15 & 16 of published PDD two para states two different benchmarks approach i.e. one states WACC and other para PLR. PP shall clarify and correct it.

Project participant response	**Date:** 06/06/2020

1. There are no tax benefits on proposed project activity in host country.

2. The price of diesel has increasing trend historically given the industry demand, however the PKS price is not changed not having increasing trend. PP has considered escalation on price of diesel and has applied on both PKS and Diesel based on average annual price increase calculated for diesel for last 10 years taking a conservative approach, which is appropriate.

3. As per host country regulation 100% depreciation is allowed hence salvage value is considered as zero.

4. The supportive evidence for diesel and PKS price is provided along with this response.

5. The para mentioned in PDD is taken from tool, which indicates either can be chosen as appropriate in a context, the PP has chosen the PLR as benchmark which is appropriate in given context. There was error as WACC mentioned is removed in revised PDD.

Documentation provided by project participant

1. *PKS price quotation*

2. *Diesel price reference*

3. *IRR spreadsheet version 02*

4. *PDD version-02*

DOE assessment	**Date:** 30/06/2020

1. PP clarified that there is no tax benefits on the waste water treatment projects, this is further confirmed by local expert in validation team.

2. The explanation provided by PP is reassessed by the validation team and found that the approach considered by PP is resulting in conservative approach; details of the same shall be provided in main section of validation report.

3. PP has provided the justification of host country law, and the rate of depreciation has been checked from Article 11 of Income Tax Law 36, wherein it has been clearly mentioned that the value of asset to be fully depreciated for considered useful life. http://www.flevin.com/id/lgso/translations/Laws/Law%20No.%2036%20of%202008%20on%20the%20Fourth%20Amendment%20of%20Law%20No.%207%20of%201983%20on%20Income%20Tax.pdf . Therefore salvage value of zero is acceptable to the validation team.

4. Supportive evidences of PKS submitted by PP and found consistent with the IRR sheet and PDD.

5. PP has clarified that there was an error and WACC was erroneously included in PDD, justification accepted.

Hence, CL 04 is closed.

CL ID	05	**Section no.**	D.4.1	**Date:** 22/05/2020

Description of CAR

1. Under section B.4 of the PDD, other alternatives for baseline scenarios are not discussed and ruled out (Refer General Guidance to SSC project activities). Please shall also substantiate which para/clause of

methodology applicable to the baseline. 2. PP shall also clarify that which example of Non-binding best practice is applicable to their case as per applied methodology. This shall be explicitly included in PDD.
Project participant response **Date:** 06/06/2020
1. The baseline scenario is established in line with para 36 and 37 of applied approved methodology, which clearly states that baseline to be established for existing projects based historical data or Non-binding best practice example 6: Ex-ante measurement campaign for existing facilities. The same is also in line with para 43 of General Guidance to SSC project activities. Further as project involve capacity expansion as well, however even with capacity expansion of FFB processing the existing lagoons capacity is sufficient to treat the addition expected wastewater generation, hence, there is no investment required baseline. Hence in absence of the proposed project activity, the PP will continue to treat the wastewater in existing open lagoons. The capacity details of existing lagoons is provided which clearly supports above. 2. Non-binding best practice example 6: Ex-ante measurement campaign for existing facilities is applicable for establishing baseline scenario for the project activity.
Documentation provided by project participant
PDD Version-02
DOE assessment **Date:** 30/06/2020
1. The justification provided by PP is found to be acceptable, hence, finding is closed. 2. PP has clarified the example 6 is applicable to their case, the same has been checked and found reasonable. Hence, CL 05 is closed.

Table 2. CAR from this validation

CAR ID	01	**Section no.**	D.9, D.10, D.11	**Date:** 22/05/2020
Description of CAR				
1. LoA from host country (Indonesia) is not submitted, requirements of section 7.1 VVS version 02 have not been met. 2. Modality of Communication (MoC) is not submitted, requirement of section 7.1 of VVS version 02 have not been met.				
Project participant response				**Date:** 30/10/2020
The LoA and the signed MoC has been provided.				
Documentation provided by project participant				
DOE assessment				**Date:** 06/11/2020
The LoA dated 26/10/2020 and the signed MoC dated 30/10/2020 has been provided now by the PP and was found to be acceptable. Hence, the finding is closed.				

CAR ID	02	**Section no.**	D.2	**Date:** 22/05/2020
Description of CAR				
Under section A.1 of the PDD, as per the PDD Form filling guidelines, PP needs to mention the following: a) The project boundary b) Additional specific instructions for small-scale project activities: 1. Indicate the small-scale project type (Type I, Type II and/or Type III) applicable to the project activity in accordance with the project standard. 2. If applicable, indicate and demonstrate that the project activity qualifies for microscale project type (Type I, Type II and/or Type III) in accordance with the project standard. 3. If there is more than one component in the project activity, indicate the small-scale or microscale project type for each component separately.				
Project participant response				**Date:** 06/06/2020

The project boundary is briefly described in Section A.1 of the PDD 1. The project activity falls under Type-III Other Project Activities, the same has been incorporated in section A.1 of PDD 2. The project activity is small scale project activity and same is demonstrated in methodological section of PDD 3. Not applicable as mentioned above
Documentation provided by project participant
PDD Version-02
DOE assessment **Date:** 30/06/2020
The project boundary and the additional information based on small scale activity has been mentioned in the revised PDD and found consistent. Hence, CAR 02 is closed.

CAR ID	03	**Section no.**	D.3	**Date:** 22/05/2020
Description of CAR				
Under section A.4 of the PDD, the name of the PP was found to be inconsistent with the cover page.				
Project participant response				**Date:** 06/06/2020
There was typo error, the same has been corrected in revised PDD.				
Documentation provided by project participant				
PDD Version-02				
DOE assessment				**Date:** 30/06/2020
The PP name is now consistent in the section A.4 and cover page of the revised PDD. Hence, CAR 03 is closed.				

CAR ID	04	**Section no.**	D.3	**Date:** 22/05/2020
Description of CAR				
Under section A.6 of the PDD, as per the PDD Form filling guidelines, PP needs to declare whether: (a) The proposed CDM project activity was a CPA that has been excluded from a registered CDM PoA; (b) A registered CDM project activity or a CPA under a registered CDM PoA whose crediting period has or has not expired (hereinafter referred to as former project) exists in the same geographical location as the proposed CDM project activity				
Project participant response				**Date:** 06/06/2020
The same has been already incorporated in PDD				
Documentation provided by project participant				
PDD Version-02				
DOE assessment				**Date:** 30/06/2020
The declaration has been provided in the revised PDD. Hence, CAR 04 is closed.				

CAR ID	05	**Section no.**	D.4.1	**Date:** 22/05/2020
Description of CAR				
1. Under section B.1 of the PDD, the reference links for “General guidelines for SSC CDM methodologies (Version 23.0)” and “Sampling and surveys for CDM project activities and programme of activities (Version 04)” is not functional. 2. Under section B.2 of the PDD, PP needs to mention the version for the “General guidelines for SSC CDM methodologies”.				
Project participant response				**Date:** 06/06/2020
1. The reference links for “General guidelines for SSC CDM methodologies (Version 23.0)” and “Sampling and surveys for CDM project activities and programme of activities (Version 04)” is updated in revised PDD 2. The version of “General guidelines for SSC CDM methodologies” is incorporated in revised PDD				
Documentation provided by project participant				
PDD Version-02				

DOE assessment	Date: 30/06/2020

1. The reference links are now functional in the revised PDD.

2. The version of the General guidelines for SSC CDM methodologies" has been provided in the revised PDD.

Hence, CAR 05 is closed.

CAR ID	06	Section no.	D.4.5	Date: 22/05/2020

Description of CAR

1. Under section B.4 of the PDD, PP needs to provide reference source/link of "Ministerial Regulation of Environment number 5/2014 about Waste Water Quality Standards".

2. Under section B.4 of the PDD, the value of COD removal efficiency of the baseline treatment system I could not be found from the supportive provided (PT.PAM Internal testing POME COD data). Calculations to be provided (if any).

Project participant response	Date: 06/06/2020

1. The reference source for "Ministerial Regulation of Environment number 5/2014 about Waste Water Quality Standards" is provided along with this response.

2. The Calculation details is provided in Appendix of PDD, moreover there was typo error the internal test report for PT Tintin is attached along with this submission.

Documentation provided by project participant

PDD version-02
Ministerial Regulation of Environment number 5/2014 about Waste Water Quality Standards

10 days campaign on COD report

DOE assessment	Date: 30/06/2020

1. The reference source document provided by the PP has been checked and it was confirmed that, there is no regulation on technology selection, however, the waste water quality can be discharged to sea/river is required to be as BOD 100 mg/l and COD 350 mg/l.

2. The calculations in appendix 3 of the PDD have been checked along with the COD internal test report dated 31.03.2020 and it can be confirmed that the COD removal efficiency of the baseline treatment system is 92.61%, which is consistent in section B.4 of the revised PDD.

Hence, CAR 06 is closed.

CAR ID	07	Section no.	D.4.6	Date: 22/05/2020

Description of CAR

1. Under section B.5 of the PDD, PP needs to mention reference link for "Income tax law 36 of 2008".

2. Under section B.5 of the PDD, the value of Post-tax project IRR with CDM revenues could not be found in the IRR sheet.

3. Under sensitivity analysis, the variation and breaching values of each particular was found to be inconsistent with the IRR sheet.

Project participant response	Date: 06/06/2020

1. The reference link is incorporated in revised PDD for "Income tax law 36"

2. The project IRR with CDM revenue is now mentioned in sensitivity analysis work sheet.

3. There was typo error the same has been corrected and now is consistent in IRR and PDD.

Documentation provided by project participant

PDD Version-02
IRR Version-02

DOE assessment | **Date:** 30/06/2020

Validation team has checked section B.5 of the revised PDD and confirms that-

1. The reference link for the income tax law has been incorporated and is now consistent.
2. The value of Post-tax project IRR with CDM revenues is now consistent in section B.5 and the sensitivity analysis sheet.
3. The variation and breaching values of capital cost, revenue due to diesel & PKS, and O & M cost, are now consistent in section B.5 and the sensitivity analysis sheet.

Hence, CAR 07 is closed

CAR ID	08	**Section no.**	D.4.8	**Date:** 22/05/2020

Description of CAR

1. Under section B.6.1 of the PDD, the version of the methodology applied i.e. 16 is inconsistent with other sections of the PDD. Also, the paragraph 18 indicated is inconsistent.
2. Under section B.6.2 of the PDD, for the ex-ante parameter "UF_{PJ}", the source referring to paragraph 39 of the AMS-III.H methodology is inconsistent. It should paragraph 40.
3. Under section B.6.2 of the PDD, for the ex-ante parameter "$EF_{EL,j,y}$", PP needs to mention which tool has been used.

Project participant response | **Date:** 06/06/2020

1. There was typo error the latest version of applied methodology and relevant paragraph is referred in revised PDD.
2. There was typo error relevant paragraph i.e. para 40 is referred in revised PDD as per latest version of applied methodology.
3. The tool 05 version 03 referred is incorporated in revised PDD

Documentation provided by project participant

PDD version-02

DOE assessment | **Date:** 20/09/2020

1. The version (AMS. III. H, Version 19) and para (25) reference of the methodology has been corrected, which is now consistent in the revised PDD.
2. The correction has been done in "Choice of data or measurement methods and procedures".
3. The tool used has been mentioned in the revised PDD.

Hence, CAR 08 is closed.

CAR ID	09	**Section no.**		**Date:** 22/05/2020

Description of CAR

Refer to the following comments in the ER sheet-

1. The nomenclature of "CODuntreated,i,y" and "CODremoved,PJ,y" was found to be inconsistent with the PDD.
2. The parameter "CODww,treated,PJ,y" mentioned in the ER sheet could not be foubnd in the PDD.
3. The source for the parameterrr "Qww,i,y" was found to be inconsistent.

Project participant response | **Date:** 06/06/2020

1. The nomenclature is corrected in line with applied approved methodology.

2. The parameter is incorporated in revised ER sheet.

3. There was typo error the same has been corrected in revised PDD.

Documentation provided by project participant

PDD Version-02
ER Version-02

DOE assessment	**Date:** 30/06/2020

The ER sheet has been checek and validation team confirms that-

1. The nomenclature of "CODuntreated,i,y" and "CODremoved,PJ,y" is now consistent with the PDD.

2. The parameter has been revised to CODww,treated, y in the revised ER sheet Version 2.0 and is now consistent with the PDD.

3. The source of the parameter "Qww,i,y" has now been corrected and is consistent.

Hence, CAR 09 is closed.

CAR ID	10	**Section no.**	D.3	**Date:** 31/10/2020

Description of CAR

1. In the cover page of the submitted PDD, the title of the project activity is inconsistent with the webhosted PDD.

2. In the cover page of the submitted PDD, the project participant is inconsistent with the webhosted PDD.

Project participant response	**Date:** 02/11/2020

1. The title of the project activity was changed due to DNA issued LoA with changed title, however as the correction will take longer time, PP has decided to use the title mentioned in LoA. The PP would like to confirm that this is the same project activity, can be checked from PDD published and information used for prior consideration with UNFCCC.

2. The prior consideration and web hosting of PDD was done considering main company i.e. LG International as project participant, however DNA has issued letter of approval in name of entity registered in Host country and owns the mill. PP has decided to proceed with name mentioned in letter of approval to avoid delay and the LG International will be added as PP after registration of the project activity. However as per published PDD it was clearly mentioned that PT Tintin Boyok Sawit Makmur is a subsidiary of LG International Corp.

Documentation provided by project participant

LoA
MoC

DOE assessment	**Date:** 02/11/2020

1. The validation team would like to confirm that the project activity title has been revised in order to make it consistent with the LoA. However, the project activity is the same.

2. The justification provided by PP was found to be acceptable by the validation team. As cross checked from the LoA, the DNA has issued the LoA in the name of the entity registered in the Host country i.e. PT Tintin Boyok Sawit Makmur. Therefore, the project participant has been revised in order to make it consistent with the LoA. Also, the validation team has reviewed the Letter of identity for PT PTBSM dated 30/10/2020 and confirms that PT Tintin Boyok Sawit Makmur is a subsidiary of LG International Corp.

Hence, CAR 10 is closed

Table 3. FARs from this validation

FAR ID	xx	**Section no.**		**Date:** DD/MM/YYYY
Description of FAR				
Project participant response				**Date:** DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				**Date:** DD/MM/YYYY

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Document information

Version	*Date*	*Description*
04.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM validation and verification standard for project activities" (CDM-EB93-A05-STAN); • Make editorial improvements.
03.1	11 January 2018	Editorial revision to remove an erroneously included instruction paragraph in section D.2 (Identification of project type).
03.0	31 October 2017	Revision to align with the requirements of the "CDM validation and verification standard for project activities" (version 01.0).
02.0	22 July 2016	EB 90, Annex 3 Revision to include provisions related to automatically additional project activities.
01.0	23 March 2015	Initial publication.

Decision Class: Regulatory
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