PROGRAMME DESIGN DOCUMENT FORM FOR SMALL-SCALE CDM PROGRAMMES OF ACTIVITIES (F-CDM-SSC-PoA-DD) Version 02.0

PROGRAMME OF ACTIVITIES DESIGN DOCUMENT (PoA-DD)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

>>

BWC Sustainable Biogas Recovery Programme of Activities in Indonesia
Version: 05
Date: 27/11/2012

A.2. Purpose and general description of the PoA

>>

Description of the PoA

The "BWC Sustainable Biogas Recovery Programme of Activities in Indonesia" (later on referred to as "PoA") has the intended purpose to promote the introduction of wastewater treatment technologies that are less Green House Gas (GHG) emission intensive at agro-industrial facilities. CPA under the PoA are only eligible for inclusion if their purpose is to treat biogenic organic wastewater and if their industry is listed in the The State Ministry of Environment Decree no Kep-51/MENLH/10/1995 on the Wastewater Standard for Industrial Activities. In the baseline of a typical CPA, methane emissions as a result of the treatment of wastewater are released into atmosphere. The measure implemented under the PoA involves methane recovery systems. Each small-scale CDM Program Activity (referred to later on as "CPA") under this PoA will comprise methane (biogas) recovery system(s) (referred to later on as "biogas plant") and result in aggregate emissions reductions of less than or equal to 60 kt CO_2 equivalent annually, the threshold for type III ("other project activities") CDM projects.

The CPA may also utilize the biogas as fuel to produce electricity that displaces more emission intensive electricity production in the grid.

1. **General operating and implementing framework of PoA**

The PoA is operated and implemented by PT Blue World Indonesia (hereinafter referred to as BWC). BWC is the "Coordinating / Managing Entity" (hereinafter referred to as CME). A biogas plants developed under this PoA shall be addressed as "Project Activity" and the biogas plants implementer(s) shall be addressed as "CPA implementer(s)" for this PoA.

This PoA will include the following project scenarios:
(i) Biogas plants installed at new (Greenfield) facilities;
(ii) Biogas plants installed at existing facilities
(iii) Utilization of biogas for grid connected power generation (in combination with scenario (i) or (ii))

BWC will take the following steps for the PoA implementation:
Step 1: Collect information of Project Activities.
Step 2: Scrutinize information regarding eligibility as CDM Program Activity as per Section B.2 and B.5.
Step 3: Listing eligible CPAs.
Step 4: Propose DOE to check for the consistency of these CPAs.
Step 5: Inclusion of the eligible CPA(s) under PoA, as per the consistency check by DOE.

Step 6: Report on Monitoring Instruments & System to be installed at Project Site as per the Section B.7.2
Step 7: Undertaking periodic verification by engaging DOE.

BWC will work with small scale biogas recovery system implementers to promote and support small scale biogas recovery system project activities in a way to reduce greenhouse gas emissions. Periodically the CME will consolidate an undefined number of project activities and bundle them in a CPA for the inclusion of these activities in the programme.

2. Policy/measure or stated goal of the PoA

The stated goal of this PoA is to reduce greenhouse gas emissions from wastewater treatment and promote the consumption of renewable energy by using biogas generated from wastewater treatment systems as a fuel at agro-industrial facilities throughout Indonesia.

There are no mandatory policies in Indonesia that require enterprises that discharge wastewater to reduce, recover, utilize or avoid methane emissions from wastewater treatment. There are also no mandatory policies that forbid establishment of GHG intensive methods of wastewater treatment, such as anaerobic open lagoons.

Technology for use of waste streams through advanced treatment processes for methane emissions abatement and renewable energy generation has a low penetration in Indonesia. As per the report published in Badan Pengkajian dan Penerapan Teknologi (BPPT)[1], which is a research arm of government of Indonesia, total energy generation from processing and use of waste is only 0.6% of the total energy production in Indonesia This 0.6% is the cumulative figure of numerous industries, including covering sugar cane, palm oil, rubber, paddy, wood coconut and cassava. In the report, this low penetration is attributed to the following factors:

- High cost
- High dependency on imported technology
- Lack of incentive provided by government
- Low ability of human resources

The current lagoon-based treatment system is considered the standard operating practice in industrial wastewater treatment in Indonesia. Despite numerous changes to maximum discharge standards over the years, the combination of anaerobic and aerobic/facultative lagoons remains able to meet the current permitted discharge levels for land application or waterway dischargeMaintaining a lagoon system is simple and the related technology, skills and labor are readily available in Indonesia.

3. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.

As described in bullet 2 above, there is no mandatory regulation which requires facilities that discharge wastewater to recover or utilize methane released from the wastewater treatment facilities nor is there a mandatory regulation that mandates the implementation of these biogas plants in Indonesia. The CME is promoting the proposed program on a voluntary basis and there is no binding on the CME to develop this program. Hence, the PoA is a voluntary action being coordinated and managed by CME.

Contribution to sustainable development:

The PoA will contribute to the sustainable development in Indonesia as follows:

[1] Research report titled "Indonesian Renewable Energy Development and Opportunity to Implementation of CDM Scheme" by Irhan Febijanto of Badan Pengkajian Dan Penerapan Teknologi (BPPT).

Environmental Sustainability

1. Increased performance wastewater treatment systems enable better compliance with the final discharge limit that reduces the risk of water contamination.
2. The recovery of methane from the industrial wastewater will avoid the GHG emissions into the atmosphere. This PoA thus contributes to the reduction of GHG emissions.
3. The PoA will reduce the unpleasant odour from the uncontrolled release of biogas (i.e. methane) to the atmosphere from the wastewater.
4. The CPAs may use the recovered biogas for electricity generation, in those cases the CPA will reduce the fossil fuel use and the associated GHG emissions of fossil fuel fired power plants in the grid.

Economic Sustainability

1. The CPAs under this PoA involve the utilization and operation of biogas recovery systems which require high level of skills in the operation and maintenance. The PoA therefore creates skilled employment opportunities.
2. CPAs may use the recovered biogas for electricity generation for supply to the grid. Thus the additional revenues from sale of electricity will enhance the economic viability of the proposed CPA.

Social Sustainability

1. The PoA will involve use of new technologies for methane recovery from industrial wastewater.
2. Therefore, more skills will be required to operate and maintain the recovery systems in the CPA, resulting in improvement of the local workforce quality.
3. The implementation of the innovative configuration of the wastewater treatment and methane recovery would require involvement of professionals from various fields of specialization including engineering, finance and management. Thus this PoA also leads to overall skill improvements.

Technological Sustainability

1. The PoA will create opportunities for technology transfer for use of advance wastewater treatment and biogas recovery systems for wastewater in Indonesia.
2. The PoA provides an opportunity for local engineers and plant operators to acquire know-how on the optimal maintenance and operation of a state-of-the-art biogas recovery system.

A.3. CMEs and participants of PoA

>>Coordinating/managing entity of PoA is considered the entity which communicates with the Board

Project participants being registered in relation to the proposed PoA are:

- PT Blue World Indonesia (BWC) is a private company, the Coordinating or Managing Entity (CME) and participant of PoA
- Blue World Carbon SEA Pte Ltd is a private company and participant of the PoA.

A.4. Party(ies)

Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Indonesia (host)	Private Entity: PT Blue World Indonesia	No
Netherlands	Private Entity: Blue World Carbon SEA Pte Ltd	No

A.5. Physical/ Geographical boundary of the PoA

>>

The PoA will be implemented within the geographical boundaries of Indonesia (see figure A4.1.1).

National and sectoral policies in the relevant sector are the same within the geographical boundaries of Indonesia. With regard to this PoA there are no differences in the national or sectoral policies between regions or provinces.

Figure I.A5.1 Map of Indonesia

A.6. Technologies/measures

>>

A typical CPA (that will be included in this PoA) will involve the installation of an anaerobic digester with methane recovery and may include one or more individual project sites at agro-industrial facilities in Indonesia. The technology employed will be appropriate to the site it is implemented. Any anaerobic digester technology is allowed (e.g. UASB, covered lagoon, etc.), provided it can comply with the requirements set out by CME in the eligibility criteria. Measures can be implemented at existing or Greenfield facilities.

The measures may be implemented at Greenfield or new facilities by one or more CPA implementers. CPA that utilizes biogas for the production of power can (when meeting the applicability criteria of the applied methodology) claim emission reductions for the displacement of electricity.

The following scenarios are eligible for inclusion under the PoA:

Table A.6.1 - Description of a typical small-scale CDM programme activity

Project Scenario	Description of scenario
1	Biogas plants installed at new (Greenfield) facilities
2	Biogas plants installed at existing facilities
E	Utilization of biogas for power generation (in combination with scenario 1 or 2)

CPA under the PoA are only eligible for inclusion if their purpose is to treat biogenic organic wastewater and if their industry is listed in the The State Ministry of Environment Decree no Kep-

51/MENLH/10/1995 on the Wastewater Standard for Industrial Activities.

The project activity in a CPA of this PoA may include one or more of the following technology measures:

a) Substitution of aerobic wastewater treatment systems with anaerobic systems with biogas recovery and combustion;
b) 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;
c) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, 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).

As a general description, the new anaerobic digester system will treat the wastewater in a manner that enables the biogas to be collected and extracted for combustion. A CPA may include one or more of the following technology measures to combust methane:

a) Thermal or mechanical, electrical energy generation with methane recovered by the above defined measure (in case emission reduction is claimed for electricity generation then the CPA must supply electricity to a national or a regional grid); or supply electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.
b) Destruction of recovered methane in a flare

The main essential feature of the anaerobic digester system is a vessel to retain organic wastewater in which methane is produced and captured from the anaerobic digestion process. The vessel will typically be an in-ground anaerobic reactor but may include other configurations in order to suit the specific requirements of each project site such as above ground tanks. The anaerobic digester system will also typically include but not be limited to:

a) A control system for piping wastewater in the digestion vessel
b) A system for collecting and distributing the biogas
c) Biogas treatment systems which may include H_2S and moisture removal
d) Equipment for destroying the collected methane which may include, biogas engines for electricity generation, burners for heat generation and flares for destruction of excess biogas
e) A system for piping wastewater from the biogas system to open lagoons or aerobic treatment (this may include land application).

Monitoring system (all scenarios)

Each CPA will have proper monitoring equipment that will be calibrated as per the applied approved monitoring methodology. Staff involved will be trained to properly operate the monitoring system. Detailed description of the monitoring system is provided in each CPA-DD.

The data of the operational and monitoring parameters will be collected by CPA implementer and forwarded to BWC. Data will be recorded electronically (kept for two years after the end of the crediting period) and recorded separately. The monitoring data will be printed periodically as a backup procedure.

A.7. Public funding of PoA

>>

No public funding is used to implement this Programme of activities (PoA). Furthermore the CME will ensure that, at the time of inclusion of CPA, there is no public funding from Annex - I parties received. This can be confirmed through mandate / declaration given by CPA implementer to CME. In case public

funding is received for CPA, an affirmation will be provided that such funding does not result in a diversion of Official Development Assistance (ODA).

SECTION B. Demonstration of additionality and development of eligibility criteria
B.1. Demonstration of additionality for PoA
>>
The proposed PoA is a voluntary coordinated action by the CME as explained in section A.2 of this document.

If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;

The information presented here constitutes the demonstration of additionality of the PoA as a whole.

Industries in Indonesia have the legal obligation to treat their wastewater within the discharge limits set out in Indonesian environmental regulations. This regulation does not mandate the usage of a particular wastewater treatment technology.

There is no regulation in the host country regarding the nature of technology (i.e. anaerobic digester) to be implemented for the treatment of wastewater. The relevant regulation for the disposal of wastewater to the environment only defines a minimum decomposition rate for the organic matter[2] contained in the wastewater. As a result, industries typically apply simple and low cost methods for wastewater treatment. In practice this means that facilities apply anaerobic open lagoons to treat the wastewater in a simple and cost-effective manner. Furthermore there is no requirement for methane recovery in the anaerobic wastewater treatment plants. The capture of methane is not incentivized by the public sector.

In the absence of any mandate from the government or other incentives the investment into anaerobic digesters equipped with methane recovery would not occur. The compliance with the environmental regulation can be achieved easily with well-functioning technologies/treatments that are easy to operate and that do not involve a comparable investment cost. Open lagoon systems achieve similar treatment efficiencies, but do not recover methane.

Although the above constitutes the demonstration of additionality for the PoA as a whole, implementation conditions for each CPA vary. Therefore, each CPA under the PoA shall demonstrate their additionality individually Each CPA implementer shall provide an explanation in the respective CPA-DD why the activity would not have occurred in the baseline through one of the additionality demonstration approaches described in the section B.5 of the PoA-DD. This CPAs additionality implies PoA additionality, because, if CPAs were feasible without CDM, then the promoters of the CPAs would not need to participate in the PoA, and there would be no scope for it.

This PoA is not implementing a mandatory policy or regulation.

Conclusion
The PoA is a voluntary action, initiated by the CME and CDM revenue is a decisive factor for the decision of the CME to develop the PoA. Furthermore, the PoA is not implementing any mandatory policy/regulation requirement in Indonesia which enforce the establishment or development of methane recovery and/or destruction activities.

[2] Keputusan Menteri Negara Lingkungan Hidup, No.Kep-51/MENLH/10/1995 Tentang Baku Mutu Limbah Cair Bagi Kegiatan Industri (The State Ministry of Environment Decree no Kep-51/MENLH/10/1995 on the Wastewater Standard for Industrial Activities)', Appendix B XI

Hence, implementation of this PoA and avoidance of anthropogenic GHG emissions are additional to those that would have occurred in absence of this PoA.

B.2. Eligibility criteria for inclusion of a CPA in the PoA

>>

The CME has all competencies to check the features of potential CPAs and ensure that each CPA meets all requirements and eligibility criteria before inclusion in the registered PoA. The relevant documents for the compliance of paragraph 17 (for development and implementation of management system) annex 05 of EB 70 has been provided to the DOE for validation.

Each of the CPA to be included in the proposed PoA shall meet the following applicable eligibility criteria (considering paragraph 16, annex 05 of EB 70) as indicated in table I.B.2.

Table I.B.2.1 – Eligibility criteria for a CPA to enrol in the PoA

Nr.	Eligibility criteria description
A.	The CPA shall be located within the geographical territory of Indonesia.
B.	The CPA implementer has signed a valid contractual agreement with the CME which permits its participation and inclusion in the PoA. Furthermore, the CPA implementer has signed an undertaking/declaration to declare that it is aware of the duties and responsibilities of a CPA implementer and the acceptance of the terms and conditions of the PoA. This contract and declaration are one of the measures to avoid double counting as it would contain the name and full details of CPA implementer at the same time, the agreement/undertaking by the CPA implementer is stating that the CPA is only a part of this PoA and shall not be subscribed as a stand-alone project or part of any other PoA.
C.	The CPA must demonstrate that the participation of the CPA is voluntary and there is no requirement or enforcement under existing national/state/local regulations to introduce anaerobic digester equipped with methane recovery system.
D.	The CPA shall confirm to one of the project scenarios as described in section A.2 of the PoA-DD
E.	The start date of the CPA shall not be before the commencement of validation of the PoA as a whole (date the PoA was published for global stakeholders comment)
F.	The CPA shall meet the applicability and other requirements of the methodology AMS.III.H Version 16.
G.	Demonstration of additionality as described in section B.5 of the PoA-DD in line with paragraph 7 and 9 of annex 05, EB 70. Additionality for the CPAs is demonstrated by applying one of the two options as following: **<u>Approach 1:</u>** In case the CPAs falling into Microscale projects (up to 5 MW): Documentation to support the conditions satisfied based on “Guidelines for demonstrating additionality of microscale project activity”, version 04, Annex 26 of EB 68; **<u>Approach 2:</u>** For CPAs as small scale project activities: evidences that at least one of the barriers described in the section B.5 (according to the “Guidelines on the demonstration of additionality of small-scale project activities”, Version 09.0 annex 27, EB 68 or the latest version at the time of inclusion) would prevent the implementation of the proposed CPAs.
H.	The CPA shall conduct an Environmental Analysis (if mandated by law) at CPA level. This shall be carried out prior to the inclusion.

Nr.	Eligibility criteria description
I.	CPA of the PoA shall be within the threshold (i.e. emission reduction of less than or equal to 60 kilotons of CO_2 equivalent annually) as per the §14 of applied Baseline and Monitoring Methodology AMS III.H version 16.
J.	Confirmation that the CPA is not registered or being registered as a stand-alone CDM project outside of this PoA, a bundled CDM Project Activity or another registered PoA. The CPA shall not lead to double counting of emission reductions.
K.	Confirmation that the CPA is not a de-bundled component of another large-scale CPA or CDM project activity as per latest guidance given by the CDM Executive Board
L.	Confirmation on involvement of public funding or ODA from Annex I Parties in CPA-DD
M.	A CPA level local stakeholder's consultation has to be carried out prior to inclusion.
N.	The CPA implementer shall be duly registered by the Indonesian authorities prior to inclusion
O.	The CPA shall be in conformance to statutory requirements of Indonesia.
P.	Confirmation on the crediting period of the CPA which shall not exceed the length of the PoA (28 years) regardless of the time of inclusion of CPA in the PoA
Q.	The CPA shall not involve biomass storage under anaerobic conditions.
For CPA that also apply scenario E, the following additional eligibility criteria shall be met. CPA that only apply scenario 1 or 2 do not need to comply with the below mentioned additional criteria.	
R.	CPA of the PoA shall be within the threshold (i.e. combined installed electricity generation capacity less than or equal to 15 MW) the limit for small-scale project activities
S.	The CPA shall meet the applicability and other requirements of the methodology AMS.I.D Version 17.
T.	The plant must be connected to an Indonesian Electricity Grid.

B.3. Application of methodologies

>>

The approved baseline and monitoring methodology applied to a CPA included in this PoA is:

- AMS-III.H "Methane Recovery in Wastewater Treatment" Version 16, EB 58, Sectoral Scope 13.
- AMS.I.D: "Grid connected renewable electricity generation"; Version 17, EB 61, Sectoral Scope 01.

Selected methodologies are approved for application to CPAs under PoAs by the Board.

Reference to the approved baseline and monitoring methodologies:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved

The approved Methodological Tools applied to a CPA included in this PoA are:

- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, Version 02 (EB 41 annex 11).
- "Tool to calculate the emission factor for an electricity system", Version 2.2.1 (EB 63 annex 19)
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 01 (EB 39 annex 7).
- "Tool to determine project emissions from flaring gases containing methane", Version 01 (EB 28 annex 13).

Reference to the applied Methodological Tools:

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/

In addition the following guidelines and standards are applied in the PoA:

- Standard for demonstration of additionality, development of Eligibility criteria and application of multiple methodologies for Programme of activities, Version 02.0, Annex 5 EB 70
- General Guidelines to SSC CDM methodologies, Version 19, Annex 27 EB 69
- Guidelines on the Assessment of Investment Analysis, Version 05, Annex 5 EB 62
- Non-binding best practice examples to demonstrate additionality for SSC project activities, Annex 34, EB 35
- Guidelines for Objective Demonstration and Assessment of Barriers, Version 01, Annex 13 EB 53
- "Guidelines on the demonstration of additionality of small-scale project activities", Version 09.0 annex 27, EB 68
- Guidelines on assessment of de-bundling for SSC project activities, Version 03, Annex 13 EB 54

The following combinations of measures and methodology are possible under the PoA:

Table I.B.3 – measure and methodology combinations

Measure	Methodology combination
A CPA which may include one or more of the following technology measures for the treatment of wastewater: a) Substitution of aerobic wastewater treatment systems with anaerobic systems with biogas recovery and combustion; b) 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; c) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, 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). And: A CPA which may include one or more of the following technology measures to combust methane: c) Thermal or mechanical, electrical energy generation with methane recovered by the above defined measure. d) Destruction of recovered methane in a flare	AMS.III.H
A CPA which may include one or more of the following technology measures for the treatment of wastewater: a) Substitution of aerobic wastewater treatment systems with anaerobic systems with biogas recovery and combustion; b) Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic	AMS.III.H and AMS.I.D

tank or an on site industrial plant; c) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, 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). A CPA which may include one or more of the following technology measures to combust methane: a) Thermal or mechanical, electrical energy generation with methane recovered by the above defined measure (in case emission reduction is claimed for electricity generation then the CPA must supply electricity to a national or a regional grid; or supply electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling. b) Destruction of recovered methane in a flare	

Part II - generic CPA-DD is prepared for both methodology combinations.

In case the applied approved methodology is revised or replaced, subsequent to being placed on hold, the CME will update the eligibility criteria to the requirements of the revised or new methodology with immediate effect. A new version of the PoA-DD and generic CDM-CPA-DD containing updated eligibility criteria validated by a DOE will be submitted to the Board for approval.
Such revisions are not required in cases where a methodology is revised without being placed on hold or withdrawn.

SECTION C. Management system
>>
The CME in their management system has all competencies to check the features of potential CPAs and ensure that each CPA meets all requirements and eligibility criteria before inclusion in the registered PoA. The relevant documents for the compliance of para 19 (for development and implementation of management system) annex 5 of EB 70 has been provided to the DOE for validation.

(a) **A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies;**

As its operation and management plan the CME establish and maintain an electronic database that containing information of all the CPA's in the programme. Details of the operation and monitoring plan are as follows:

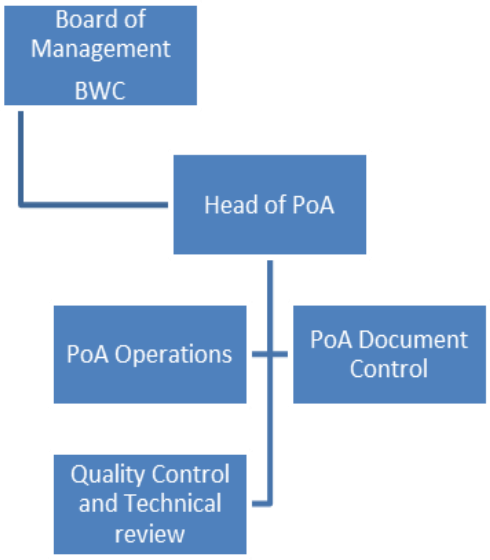


Figure A.4.4.1.1 - CME organisation chart for PoA Management and development

Based on the above defined chart the roles and responsibilities can be defined as shown in the table A.4.4.1.1:

Table C.1 - CME organisation roles and responsibilities

Department	**Management Responsibilities and Arrangements**
Board of Management	Registration of the PoA Implementation of the Program objectives Ensuring proper overall management of the PoA CER issuance
Head of PoA	Program operation as per CDM guidelines and board of management strategy. Proper and timely validation of the PoA Review of program compliance as per guidelines Awareness creation and promotion of the PoA Ensuring proper CDM project operation and management as per required guidelines and board of management strategy throughout the crediting period.
PoA Operations	This department has two main objectives: securitizing and preparation of documentation for initial inclusion of a CPA and monitoring and verification of included CPAs. (Pre) inclusion activities: Inclusion of CPA under the PoA Review of CPA compliance as per guidelines Ensure verification of CPAs Identification of CPA Listing of eligible CPA's Inclusion of eligible CPAs under PoA CPA-DD and PoA-DD Development Investment analysis for CPA's Validation and verification activities: Validation and verification support to CPA implementer throughout the

	crediting period. Preparation of monitoring report for Emission Reduction Monitoring and record keeping of monitoring parameters. Review and improvement suggestions of monitoring system and plan Monitoring Support to CPA implementers
PoA Document Control	Collecting information and documentation of the CPA Collection and scrutiny of all documents related to the eligibility criteria of CPA inclusion Focal point for CPA Implementers Collection of necessary statutory approvals from CPA implementers General document control
Quality Control and Technical review	Internal quality audit, Process and continuous improvement proposal reporting to stakeholders and management. Quality control of supporting documents and site information Technical review of the CPA-DD documentation.

Information regarding the assignment of roles on organizational level, as well as procedures and documentation to review the competences of staff involved in the CPA inclusion and PoA development process will be forwarded to the DOE at time of validation of the PoA and CPA inclusion.

(b) **Records of arrangements for training and capacity development for personnel;**

The CME will maintain and provide the DOE with a record of past training and a plan for the training and capacity development of its personnel at time of validation of the PoA-DD.

(c) **Procedures for technical review of inclusion of CPAs;**

A technical review procedure and associated forms have been developed. These are provided to the DOE for assessment during validation of the PoA-DD and at time of validation of CPA inclusion.

(d) **A procedure to avoid double counting**

The CME will confirm that the Project activities included in the CPA is not registered in any other CPA of the PoA or any other registered CDM Project activity through following procedure to avoid double counting of CPA under any other CDM or PoA activity -

1. At time of CPA eligibility check, CME will seek confirmation in CPA and also check any-double counting using public information sources like UNFCCC website data.

2. The CME will maintain a record with the unique identification information that is publicly available.

Furthermore at the time of inclusion the CME is taking a declaration from the CPA implementer (as a part of mandate) as below-

Mandate by CPA implementer shall state that "there is no double counting of CERs from this CPA under any CDM Project or CPA in another PoA".

(iii) The CPA included in the PoA is not a debundled component of another CDM Programme Activity or another CDM Project activity:

The CME will follow the "*Guidance for determining the occurrence of de-bundling under a Programme of Activity"* (version 03, EB 54, Annex 13) to ensure that the proposed CPA is not a de-bundled component of a large scale activity.

Para 8: For the purposes of registration of a Programme of Activities (PoA),[3] a proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity[4], which satisfies both conditions (a) and (b) below:
(a) Has the same activity implementer as the proposed small scale CPA or has a coordinating or CME, which also manages a large scale PoA of the same technology/measure, and;
(b) The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point.

Para 9: If a proposed small-scale CPA of a PoA is deemed to be a debundled component in accordance with paragraph 8 above, but the total size of such a CPA combined with a registered small-scale CPA of a PoA or a registered CDM project activity does not exceed the limits for small-scale CDM and small-scale A/R project activities as set out in Annex II of the decision 4/CMP.1[5] and 5/CMP.1 respectively, the CPA of a PoA can qualify to use simplified modalities and procedures for small-scale CDM and small-scale A/R CDM project activities.

Para 10: If each of the independent subsystems/measures (e.g., biogas digester, solar home system) included in the CPA of a PoA is no larger than 1% of the small-scale thresholds defined by the methodology applied[6], then that CPA of PoA is exempted from performing de-bundling check i.e., considering as not being a de-bundled component of a large scale activity.

In relation to the Para 8, if CPA does not satisfy both the condition 8 (a) and 8 (b), the proposed small scale CPA of a PoA is not deemed to be debundled component of a large-scale activity, therefore is eligible to use the simplified modalities and procedures for small-scale Project activities. However if CPA satisfy above conditions and the total size of the small scale CPA does not exceed the limit for SSC Project activity, the proposed small scale CPA of a PoA is deemed to be debundled component of a large-scale activity but can qualify to use the simplified modalities and procedures for small-scale Project activities.

In relation to para 9, CPA will be included if the total size of such a CPA combined with a registered small-scale CPA of a PoA or a registered CDM Project activity does not exceed the limits for small-scale CDM Project activity.

In relation to para 10, the rated thermal capacity of Project activity under CPA included in this PoA will be larger than 1% (i.e. 0.6 $ktCO_{2e}$ annual emission reduction) of the small scale thresholds defined by the methodology applied. Hence the CPAs included in PoA will have to perform de-bundling check as per above mentioned para 8 and 9.

The CPA implementers involved in any of the CPA under this programme shall provide the mandate to the CME to subscribe the Project under the PoA. The CME will be operating all the CPA and no separate entity will be engaged for operating the CPA of this programme.

(e) **Records and documentation control process for each CPA under the PoA;**

In order to unambiguously identify CPA participating in the PoA a serial numbering system will be implemented that uniquely identifies each CPA through numbers for the CPA and the CPA implementer. This serial numbering system will be used to record baseline and monitoring data on a continuous basis

[3] Only those PoAs need to be considered in determining de-bundling that are: (i) in the same geographical area; and (ii) use the same methodology; as the POA to which proposed CPA is being added

[4] Which may be a (i) registered small-scale CPA of a PoA, (ii) an application to register another small-scale CPA of a PoA or (iii) another registered CDM project activity.

[5] Limits have been revised as set in paragraph 28 of decision 1/CMP.2.

[6] i.e., 15 kW installed capacity or 0.6 GWh annual energy savings or 0.6 ktCO2e annual emission reductions.

using a database. In this way, the PoA CME will be able to track the emission reduction of each CPA over the full duration of the crediting period.

In summary, BWC will record and document CPA detail information as follows:

- CPA Identification number
- Name of the CPA and its production capacity
- The name, address, and CPA implementer details of each participating CPA
- The geographical coordinates of each CPA
- The record of technical specification of CPA participating in the PoA

BWC will be responsible for the management of records and data associated with each CPA. The database will be updated manually using the data supplied by the participating CPA. It will form the basis for the verification of CPAs and be available for inspection by the DOE at any point in time.

The record keeping will be carried out by using the field instruments, hardware and software installed at every project site and/or manual data recording in the log book. The captured data will be stored by the CME, which will have provision to archive the data as per individual CPAs. Each CPA implementer will carry out a periodic analysis (quarterly) of data for the individual Project. In case of any anomalies identified during the review by the CPA implementer, appropriate corrective actions will be taken.

(f) **Measures for continuous improvements of the PoA management system;**

Measures for the continuous improvement of the PoA management system are described in the designated CME Management System Manual that is available during validation of the PoA-DD and provided to the DOE for assessment at time of CPA Inclusion validation.

(g) **Any other relevant elements.**

To ensure that the CPA Implementers are aware and have agreed that their activity is being subscribed to the PoA the following provisions are provided:

The CPA implementer will provide the mandate to CME stating that, they are aware and have agreed that their activity is subscribed to the PoA. The CPA implementer has to give a declaration to CME that the CPA is not a de-bundled component of large scale Project. The CME will confirm that the Project activity is as per EB 54 Annex 13 guideline of debundling and the CPA not a de-bundled component of large scale Project.

SECTION D. Duration of PoA

D.1. Start date of PoA

>>

The starting date of the PoA is 25/05/2012. The stating date is determined as the date on which the PoA was published for Global Stakeholder Consultation on the website of the UNFCCC.

D.2. Duration of the PoA

>>

This PoA has a duration of 28 years.

SECTION E. Environmental impacts

E.1. Level at which environmental analysis is undertaken

>>

The environmental impacts analysis will be done at CPA level.

Please refer to section E.2 for the justification why the environmental impact analysis will be performed at CPA level.

E.2. Analysis of the environmental impacts

>>

A typical of CPA under this PoA involves installation of an anaerobic digester equipped with methane recovery system as the wastewater treatment unit of a facility.

In Indonesia, MenLH Decree 11/2006[7] prescribes the businesses and/or activities of various sectors which require an Environmental Impact Assessment (EIA).

There is no requirement for the wastewater treatment unit of a facility to conduct an EIA as per the aforementioned regulation. Therefore, any CPA under this PoA will not be required to conduct an EIA. Note that CPA will consider applicable regulations at time of inclusion and comply with any relevant new regulation.

In case CPA utilize biogas for power generation, their capacity will have a maximum installed capacity of 15 MW. Based on the Decree of the Minister of the Environment (MENLH No.11/2006) of Indonesia, such renewable energy project with a capacity less than 50 MW is not required to prepare an Environmental Impact Assessment (hereinafter referred to as EIA). However, all proposed businesses or activities which are not expected to have significant impacts and/or for which suitable technology exists for management of significant impacts shall implement Environmental Management Procedures (UKL/ Upaya Pengelolaan Lingkungan) and Environmental Monitoring Procedures (UPL/Upaya Pemantauan Lingkungan) in accordance with applicable laws and regulations. And, all new CPAs will be updated the new regulations and laws applicable at the time of CPA inclusion.

Therefore, CPA implementers are not required to prepare an EIA report, but shall prepare UKL/UPL instead in order to comply with the requirement set by the MENLH No.11/2006. An approved UKL/UPL comprises of description of minor impacts the environment and consists of identification the corrective

SECTION F. Local stakeholder comments

F.1. Solicitation of comments from local stakeholders

>>

Local stakeholder consultation is done at CPA level. Local and focalized impacts of each biogas plant justify a local stakeholder consultation at CPA level.

F.2. Summary of comments received

>>

Not applicable. The stakeholder consultation will be on CPA level.

F.3. Report on consideration of comments received

>>

[7] MenLH Decree 11/2006 “Business and/or activity type which require an Environmental Impact Assessment (EIA)”

Not applicable. The stakeholder consultation will be on CPA level.

SECTION G. Approval and authorization

>>

Letters of approval from Parties wishing to be involved in the PoA have been obtained. The letter of approval from the DNA of Indonesia was issued on 29/10/2012. The letter of approval from the DNA of the Netherlands was issued on 25/09/2012.

(a) **Parties involved in the proposed PoA**

The following parties are involved in the PoA:

1. Indonesia (host)
2. Netherlands

It is envisaged that other countries may be added to the Program in terms of the provisions of EB 70 Annex 5 Paragraph 25.

(b) **CME letters of authorization of its coordination of the PoA from each Party**

The DNA of Host Party Indonesia has authorized PT Blue World Indonesia as the coordinating/managing entity (CME) of the "BWC Sustainable Biogas Recovery Programme of Activities in Indonesia" through the letter of approval that was issued by the DNA of Indonesia on 29/10/2012.

PART II. Generic component project activity (CPA)

As explained in Part I, section B.3, Table I.B.3 – measure and methodology combinations, under this PoA two possible methodology and measure combinations are possible:

(a) CPA that apply only methodology AMS.III.H

(b) CPA that apply a combination of AMS.III.H and AMS.I.D.

Considering considering para 14(h) of the Project Standard (EB 70, annex 04) a generic CPA-DD is prepared for each methodology combination.

SECTION A. General description of a generic CPA

****

NOTE: THIS GENERIC CPA-DD BELOW EXPLAINS CPA THAT APPLY ONLY METHODOLOGY AMS.III.H ONLY. REFER TO SECTION C OF PART II FOR GENERIC CPA-DD THAT APPLY A COMBINATION OF AMS.III.H AND AMS.I.D.

****

A.1. Purpose and general description of generic CPAs

>>

The purpose of a typical CDM Programme Activity (CPA) is recovering biogas from organic matter in wastewater treatment plants within the host country, combined with flaring and/or gas utilization. A CPA is constituted by one project activity. The measure(s) may include one or more individual project sites and lead to an annual emission reduction not exceeding 60 kt CO_2 equivalents annually. The measures may be implemented at Greenfield or new facilities by one or more CPA implementers.

The following scenarios are eligible for inclusion under the PoA:

Table II.A.2.1 - Description of a typical small-scale CDM programme activity

Project Scenario	Description of scenario
1	Biogas plants installed at new (Greenfield) facilities
2	Biogas plants installed at existing facilities

The Project activity is a small-scale PoA Program activity and conforms with Appendix B of the simplified modalities and procedures for small-scale CDM Project activities. A monitoring plan and data recording and archiving system will be implemented, where BWC will keep all records for the production of the monitoring reports.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

>>

The approved baseline and monitoring methodology applied to a CPA included in this PoA is:

- AMS-III.H "Methane Recovery in Wastewater Treatment" Version 16, EB 58, Sectoral Scope 13 (Waste handling and disposal)

Selected methodologies are approved for application to CPAs under PoAs by the Board.

Reference to the approved baseline and monitoring methodologies:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved

The approved Methodological Tools applied to a CPA included in this PoA are:

- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, Version 02 (EB 41 annex 11).
- "Tool to calculate the emission factor for an electricity system", Version 2.2.1 (EB 63 annex 19)
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 01 (EB 39 annex 7).
- "Tool to determine project emissions from flaring gases containing methane", Version 01 (EB 28 annex 13).

Reference to the applied Methodological Tools:

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/

B.2. Application of methodology(ies)

>>

The project activities in this PoA comply with the applicability conditions as stipulated in AMS.III.H Version 16 as indicated in the table below.

Table II.B.2.1: Applicability conditions of methodology AMS.III.H Version 16[8]

Applicability Conditions	CPA Status	Documentation required
1. This methodology comprises measures that recover biogas from biogenic organic matter	Each proposed CPA under this PoA will be in relation to recovery of methane (i.e.	☐ Feasibility Study or Technical

[8] The number in front of each paragraph indicates the respective paragraph of AMS.III.H Version 16.

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;[9] (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 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).	biogas) from anaerobic treatment of industrial wastewater in an anaerobic digester system, which would have otherwise been emitted into the atmosphere. The measure to be introduced in each CPA includes option 1(a), 1(d) or 1(f), as identified in paragraph 1 of AMS-III.H version 16.	Proposal of the project
2. 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. The value for depth is obtained from engineering design documents, or through direct measurement, or by dividing the	In cases where the baseline system is anaerobic lagoons, the CME will ensure that the lagoons are in compliance with conditions (a) and (c). The CME will obtain the value for depth from engineering design documents, or	To confirm §2(a): ☐ Feasibility Study or Technical Proposal of the project ☐ Engineering design of the open lagoon (if

[9] Other technologies in Table 6.3 of Chapter 6: Wastewater Treatment and Discharge of 2006 IPCC Guidelines for National Greenhouse Gas Inventories are included.

surface area by the total volume. If the lagoon filling level varies seasonally, the average of the highest and lowest levels may be taken; (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.	through direct measurement, or by dividing the surface area by the total volume and sludge removal events from the operations logbook and confirmation from the CPA implementer. The average ambient temperature in Indonesia is 27.7[10] degrees Celsius, which is higher than 15 degrees as stated in paragraph (b).	available) ☐ Report on direct measurement of depth of lagoon or by dividing the surface area by the total volume (if engineering design not available). To confirm §2(b) ☐ Document on weather statistics from public source for the last 03 years. To confirm §2(c) ☐ sludge removal events from the operations logbook and confirmation from the CPA implementer.
3. The recovered biogas from the above measures may also be utilised for the following applications instead of combustion/flaring: (a) Thermal or mechanical,[11] electrical energy generation directly; (b) Thermal or mechanical, electrical energy generation after bottling of upgraded biogas, in this case additional guidance provided in Annex 1 shall be followed; or (c) Thermal or mechanical, electrical energy generation after upgrading and distribution, in this case additional guidance provided in Annex 1 shall be followed:	The recovered biogas from the above measures may also be utilised for application (a) of the applications listed in paragraph 3. This will be determined by reviewing the technical design documentation of the project at time of inclusion (as per eligibility criteria of the project). CPA where biogas is utilized for applications as listed in paragraph 3 (b) to	☐ Feasibility Study or Technical Proposal of the project

[10] http://www.climatetemp.info/indonesia/

[11] For example combusted in a prime mover such as an engine coupled to a machine such as grinding machine.

(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 upgrading.	(e) are not eligible for inclusion under this PoA.	
4. 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.	CPA shall only be allowed to claim emission reduction for AMS.III.H. Emission reductions under other methodology shall not be accounted for.	
5. For project activities covered under paragraph 3 (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".	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
6. For project activities covered under paragraph 3 (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 host country boundaries.	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
7. For project activities covered under	Not applicable. CPA where biogas is utilized for	

paragraph 3 (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.	applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
8. In particular, for the case of 3 (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 11 of Annex 1 of AMS-III.H "Methane recovery in wastewater treatment" shall be followed in this regard.	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
9. For project activities covered under paragraph 3 (b) and (c), this methodology is applicable if the upgraded methane content of the biogas is in accordance with relevant national regulations (where these exist) or, in the absence of national regulations, a minimum of 96% (by volume).	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
10. If the recovered biogas 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. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
11. If the recovered biogas is used for project activities covered under paragraph 3 (e), that component of the project activity shall use corresponding methodology AMS-III.AQ "Introduction of Bio-CNG in road transportation".	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
12. 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.	In case of CPA that are Greenfield projects, the baseline scenario shall be determined in accordance with latest version of the General Guidance on General Guidelines to SSC CDM methodologies.	☐ Description in the specific CPA-DD on the consideration of requirements of the General Guidance on General Guidelines to SSC CDM methodologies.
13. 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 as well as the source generating the wastewater will be uniquely defined	☐ Description in the specific CPA-DD of the location of the wastewater

	and described in the specific CPA-DD.	treatment plant as well as the source generating the wastewater in section A.5 and location in section A.7 of the CPA-DD.
14. Measures are limited to those that result in aggregate emissions reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity.	CPAs to be included in the PoA shall be limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	☐ Emission reduction calculation worksheet prepared for the CPA as per methodology requirements. ☐ Description in the specific CPA-DD that the CPA result in aggregate emissions reductions of less than or equal to 60 kt CO_2 equivalent annually
38. The following conditions apply for use of this methodology in a project activity under a programme of activities: In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.	In case the project activity involves the replacement of equipment this paragraph will be taken into consideration.	☐ Scrapping documentation (in case equipment was replaced).

Table II.B.2.3: Justification that CPA qualifies as Type I, II, and/or III

Applicability Conditions	CPA Status
The CPA qualifies as Type I, II, and/or III during	Project activities which result in GHG

every year of the creating period in accordance with applicable provisions for project activity eligibility in the project standard.	emission reductions not exceeding 60 ktCO_2e per year in any year of the crediting period can qualify as Type III. Prior to inclusion of the CPA, CME will prepare a emission reduction spread sheet calculated in line with the methodology requirements and taking into consideration future developments of the CPA implementer (capacity increase, etc). The CPA implementer and CME will confirm in the CPA-DD that the CPA will result in emission reduction of less than or equal to 60 kt CO_2 during the whole crediting period.

B.3. Sources and GHGs

>>

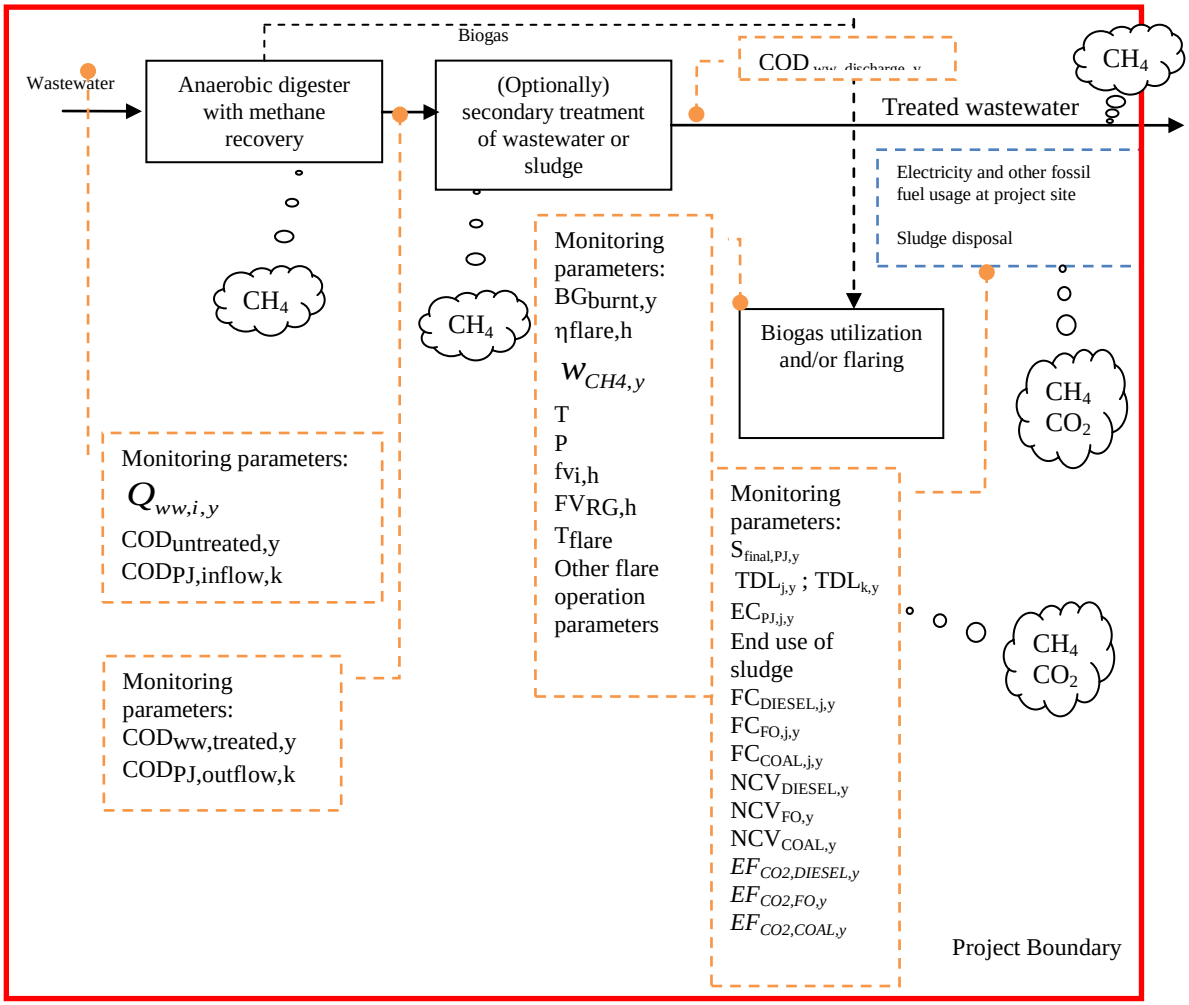
For CPA that comply with project scenario 1 or 2 the following emission sources and gases shall be included in the CPA boundary:

Table II.B.3.1 Emission sources and gases included in the CPA boundary

	Source	Gas	Included	Justification
Baseline Scenario	Decay emissions from the baseline wastewater treatment system	CO_2	No	Excluded for simplification.
		CH_4	Yes	Major emission source in case of wastewater treatment plants.
		N_2O	No	Excluded for simplification.
	Decay emissions from the baseline sludge treatment system	CO_2	No	Excluded for simplification.
		CH_4	No	Major emission source in case of sludge treatment plants.
		N_2O	No	Excluded for simplification.
	Emissions on account of electricity or fossil fuel used	CO_2	Yes	May be an important source of emission if the baseline involves the use of electricity or fossil fuels.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.
	Emissions from the discharge of the effluent into river/lake/sea	CO_2	No	Excluded for simplification.
		CH_4	Yes	Major emission source in case of wastewater being discharged to sea/river/lake.
		N_2O	No	Excluded for simplification.
	Emissions from anaerobic decay of final sludge	CO_2	No	Excluded for simplification.
		CH_4	No	Emission source in case of final sludge being disposed of anaerobically in the baseline.
		N_2O	No	Excluded for simplification.
Project Scenario	Emissions from electricity or fuel consumption in the project activity	CO_2	Yes	May be a source of emissions.
		CH_4	No	Minor source. Excluded for simplification.
		N_2O	No	Minor source. Excluded for simplification.
	Emissions from	CO_2	No	Minor source. Excluded for simplification.

	wastewater treatment system affected by the project activity and not equipped with biogas recovery	CH_4	Yes	Important emission source in case of wastewater treatment plants.
		N_2O	No	Minor source. Excluded for simplification.
	Emissions from sludge treatment system affected by the project activity and not equipped with biogas recovery	CO_2	No	Minor source. Excluded for simplification.
		CH_4	No	Important emission source in case of sludge treatment plants.
		N_2O	No	Minor source. Excluded for simplification.
	Emissions from the discharge of the effluent into river/lake/sea	CO_2	No	Minor source. Excluded for simplification
		CH_4	Yes	Important emission source in case of wastewater discharge to sea/river/lake.
		N_2O	No	Minor source. Excluded for simplification.
	Emissions from biogas release in capture system	CO_2	No	Minor source. Excluded for simplification.
		CH_4	Yes	Inefficiency in methane capture in the anaerobic digesters may contribute to methane emissions from biogas systems.
		N_2O	No	Minor source. Excluded for simplification.
	Emissions due to incomplete flaring of biogas	CO_2	No	It is assumed that CO_2 emissions from recovered biogas do not lead to changes of carbon pools.
		CH_4	Yes	May be an important source of emission. Incomplete combustion of biogas due to efficiency of flaring system leads to fugitive emission of methane.
		N_2O	No	Not applicable
	Emissions from anaerobic decay of the final sludge	CO_2	No	Excluded for simplification.
		CH_4	No	Might represent an emission source.
		N_2O	No	Excluded for simplification.
	Emissions from biomass stored under anaerobic conditions	CO_2	No	Excluded for simplification.
		CH_4	No	Might represent an emission source.
		N_2O	No	Excluded for simplification.

Figure II.B.3.1 Flow diagram of the CPA boundary for technological scenario 1 and 2



Flow diagram Figure II.B.3.1 is generic in nature but each CPA-DD is required to delineate the project boundary in a flow diagram in accordace with the completing guideline of the CPA-DD.

B.4. Description of baseline scenario

>>

As per AMS-III.H version 16, in case of existing industrial wastewater treatment facilities, the baseline will be the continuation of the existing system for wastewater treatment. This is evident in the paragraph 26 and 27 of the methodology where the past historic records or baseline measurement campaign undertaken before project implementation is required for estimating emissions associated with the prevailing baseline.

However, in case of Greenfield industrial wastewater treatment facilities and activities involving change of equipment resulting in capacity addition of the wastewater and/or sludge treatment system compared to the design capacity of the baseline system, the CPA is only eligible to use the baseline and monitoring methodology if they are able to demonstrate using the latest version of the "General Guidelines to SSC CDM Methodologies" at time of inclusion, that the most plausible baseline scenario for the project activity is the baseline provided in the baseline and monitoring methodology. The baseline determined using the "General Guidelines to SSC CDM Methodologies" will be one of the following:

- Aerobic wastewater treatment system without biogas recovery

- Anaerobic wastewater treatment system (such as lagoon, septic tank or an on-site industrial plant[12]) without biogas recovery

CPA that are greenfield facilities shall perform a baseline assessment test to determine the appropriate baseline. The baseline assessment shall be documented in annex 3 of the CPA-DD.

B.5. Demonstration of eligibility for a generic CPA

>>

Table II.B.5.1 – Eligibility criteria for a CPA to enrol in the PoA

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
A.	The CPA shall be located within the geographical territory of Indonesia.	One of the following documents shall be provided: ☐ Declaration from the CPA implementer confirm that the boundary of the implemented CPA is within the geographical territory of Indonesia and including information regarding geographic reference (latitude and longitude), name and address of the CPA. ☐ Business license of the CPA implementer issued by Indonesian local authorities.	☐ Yes ☐ No
B.	The CPA implementer has signed a valid contractual agreement with the CME which permits its participation and inclusion in the PoA. Furthermore, the CPA implementer has signed an undertaking/declaration to declare that it is aware of the duties and responsibilities of a CPA implementer and the acceptance of the terms and conditions of the PoA. This contract and declaration are one of the measures to avoid double counting as it would contain the name and full details of CPA implementer at the same time, the agreement/undertaking by the CPA implementer is stating that the CPA is only a part of this PoA and shall not be subscribed as	The following document shall be provided: ☐ Contractual agreement between CME and CPA implementer. ☐ Declaration from the CPA Implementer to declare that it is aware of the duties and responsibilities of a CPA implementer and the acceptance of the terms and conditions of the PoA.	☐ Yes ☐ No

[12] Other technologies in table 6.3 of chapter 6: Wastewater Treatment and Discharge of 2006 IPCC guidelines for National Greenhouse Gas Inventories are included.

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
	a stand-alone project or part of any other PoA.		
C.	The CPA must demonstrate that the participation of the CPA is voluntary and there is no requirement or enforcement under existing national/state/local regulations to introduce anaerobic digester equipped with methane recovery system.	The following document shall be provided: ☐ Declaration from the CPA Implementer regarding voluntary implementation of the wastewater treatment technology and confirmation that there is no requirement or enforcement under existing national/state/local regulations to introduce anaerobic digester equipped with methane recovery system. And: ☐ Confirmation in the CPA-DD regarding voluntary implementation by CPA implementer of the wastewater treatment technology and confirmation that there is no requirement or enforcement under existing national/state/local regulations to introduce anaerobic digester equipped with methane recovery system.	☐ Yes ☐ No
D.	The CPA shall confirm to one of project scenarios as described in section A.2 of the PoA-DD	The following document shall be provided: ☐ Confirmation by the CME regarding the applicable project scenario for the CPA. Any of the following documents shall be provided: ☐ Purchase order of equipment ☐ Feasibility Study / Technical Proposal of the project that describes the project technology.	☐ Yes ☐ No
E.	The start date of the CPA shall not be before the commencement of validation of the PoA as a whole (date the PoA was published for global stakeholders comment)	One of the following documents shall be provided: ☐ In case available, the earliest signed equipment or (sub) contractor agreement with a total contract value that is significant	☐ Yes ☐ No

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
		to the project activity (the date of signing the purchase order by CPA Implementer shall constitute the starting date of the CPA). ☐ Declaration of from the CPA Implementer that no contracts have been signed with a total contract value that is significant to the project activity	
F.	The CPA shall meet the applicability and other requirements of the methodology AMS.III.H Version 16.	As described in section E.2 of the PoA-DD the CPA shall meet all relevant requirements of the methodology and the required evidence documentation shall be provided to the DOE at the time of inclusion.	☐ Yes ☐ No
G.	Demonstration of additionality as described in section B.5 of the PoA-DD in line with paragraph 7 and 9 of annex 05, EB 70. Additionality for the CPAs is demonstrated by applying one of the two options as following: **<u>Approach 1:</u>** In case the CPAs falling into Microscale projects (up to 5 MW): Documentation to support the conditions satisfied based on "Guidelines for demonstrating additionality of microscale project activity", version 04, Annex 26 of EB 68; **<u>Approach 2:</u>** For CPAs as small scale project activities: evidences that at least one of the barriers described in the section B.5 (according to the "Guidelines on the demonstration of additionality of small-scale project activities", Version 09.0 annex 27, EB 68 or the latest version at the time of inclusion) would prevent the implementation of the proposed CPAs.	Any of the following documents at CPA level shall be provided: ☐ In case the CPAs falling into Microscale projects (up to 5 MW): Documentation to support the conditions satisfied based on "Guidelines for demonstrating additionality of microscale project activity", version 04, Annex 26 of EB 68; or For CPAs as small scale project activities: ☐ Evidences that at least one of the barriers described in the section B.5 (according to the "Guidelines on the demonstration of additionality of small-scale project activities", Version 09.0 annex 27, EB 68 or the latest version at the time of inclusion) would prevent the implementation of the proposed CPAs. CPA shall provide all relevant documents to substantiate the barrier analysis put forth in section B.5 of the PoA-DD to DOE at time of inclusion.	☐ Yes ☐ No

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
H.	The CPA shall conduct an an Environmental Analysis (if mandated by law) at CPA level. This shall be carried out prior to the inclusion.	The following document shall be provided: If law / regulations mandate environmental analysis: ☐ Copy of environmental analysis report. If there is no law / regulation to mandate environmental analysis: ☐ Declaration from CPA implementer regarding applicable laws for the CPA and explanation why environmental analysis is not required.	☐ Yes ☐ No
I.	CPA of the PoA shall be within the threshold (i.e. emission reduction of less than or equal to 60 kilotons of CO_2 equivalent annually) as per the §14 of applied Baseline and Monitoring Methodology AMS III.H version 16.	The CPA implementer and CME shall consider this condition in the CPA DD and Emission reduction spread sheet.	☐ Yes ☐ No
J.	Confirmation that the CPA is not registered or being registered as a stand-alone CDM project outside of this PoA, a bundled CDM Project Activity or another registered PoA. The CPA shall not lead to double counting of emission reductions.	The following document shall be provided: ☐ Declaration from the CPA Implementer confirming that the project is not registered or in the process of being registered as a stand-alone CDM project, outside of the PoA, a bundled CDM Project Activity or another registered PoA. And: ☐ Confirmation described in the CPA-DD that states that the project is not registered or in the process of being registered as a stand-alone CDM project, outside of the PoA. ☐ Confirmation check by reviewing the website of the UNFCCC.	☐ Yes ☐ No
K.	Confirmation that the CPA is not a de-bundled component of another large-scale CPA or CDM project	The following document shall be provided: ☐ Declaration from the CPA	☐ Yes

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
	activity as per latest guidance given by the CDM Executive Board	Implementer confirming that the CPA is not a de-bundled component of another large-scale CPA or CDM project activity as per latest guidance given by the CDM Executive Board. And: ☐ Confirmation that the CPA is not a de-bundled component of another large-scale CPA or CDM project activity as per latest guidance given by the CDM Executive Board shall be provided in the CPA-DD.	☐ No
L.	Confirmation on involvement of public funding or ODA from Annex I Parties in CPA	The following document shall be provided: ☐ Declaration from the CPA Implementer regarding the no involvement of public funding or ODA from Annex I Parties. And: ☐ Confirmation in the CPA-DD regarding no involvement of public funding or ODA from Annex I Parties.	☐ Yes ☐ No
M.	A CPA level local stakeholder's consultation has to be carried out prior to inclusion.	The following document shall be provided: ☐ Meeting minutes of the stakeholder consultation.	☐ Yes ☐ No
N.	The CPA implementer shall be duly registered by the Indonesian authorities prior to inclusion	The following document shall be provided: ☐ Business license of the CPA Implementer issued by Indonesian local authorities.	☐ Yes ☐ No
O.	The CPA shall be in conformance to statutory requirements of Indonesia.	The following document shall be provided: ☐ Business license of the CPA Implementer issued by Indonesian local authorities.	☐ Yes ☐ No
P.	Confirmation on the crediting period of the CPA which shall not exceed the length of the PoA (28 years) regardless of the time of inclusion of CPA in the PoA	Confirmation described in the CPA-DD that states that the crediting period of the CPA shall not exceed the length of the PoA.	☐ Yes ☐ No

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
Q.	The CPA shall not involve biomass storage under anaerobic conditions.	The following document shall be provided: ☐ Declaration from the CPA Implementer that the CPA does not involve biomass storage under anaerobic conditions.	☐ Yes ☐ No

As per eligibility criteria defined in section B.2 of the PoA-DD the CPA under this PoA shall demonstrate additionality based on the information provided in section B.5 of this PoA-DD (below).

A typical CPA can use any or a combination of the approaches described below to demonstrate additionality. Compliance with one of the approaches described below shall constitute that the particular eligibility criteria for demonstration of additionality has been met.

A. MICROSCALE PROJECTS

In the cases where the emission reductions resulting from the methane recovery activity (i.e. Type III component) is at a scale of no more than 20 ktCO_2e per year and (in case the project is generating electricity with the biogas that was recovered) the installed capacity of the power generation is no more than 5 MW installed electricity generation capacity, the CPA implementer may demonstrate the additionality of the CPA as per the "Guidelines for Demonstrating Additionality of Microscale Project Activities" version 04, Annex 26 of EB 68;

According to the "Guidelines for Demonstrating Additionality of Microscale Project Activities" (version 04, Annex 26 of EB 68) a project activity is additional if it falls into the following category of projects:

For this test, the size of the renewable project is chosen as per the generator rated capacity, while the determination if the project Type III component emission reduction is at a scale of no more than 20 ktCO_2e per year is based on the emission reduction spread sheet that is prepared for the particular CPA and is validated by the DOE. The definition of the special underdeveloped zone as per the list under the State Minister of Underdeveloped Zone Development Decree No. 001 about National Strategy for Underdeveloped Zone Development issued in 2005 [13] .The list identified by the Government before 28 May 2010 as per paragraph 2-a of EB 54 annex 15 will remain unchanged during the lifetime of the PoA. The location of the CPA will be determined as the location of the powerhouse.

Test	Yes/No/Not applicable
Type III component emission reduction is at a scale of no more than 20 ktCO_2e per year	
CPA capacity is below or equal to 5 MW	
CPA is undertaken in a special underdeveloped zone as defined by State Minister of Underdeveloped Zone Development Decree No. 001 issued in 2005	

[13] The State Minister of Underdeveloped Zone Development Decree No. 001 issued in 2005 about National Strategy for Underdeveloped Zone Development, http://www.kemenegpdt.go.id/hukum/KEPMEN_001-2005.pdf.

For CPA selecting this approach, justification shall be described in the CPA-DD to confirm the compliance with one of the above conditions.

B. SMALL SCALE PROJECT ACTIVITIES

All small scale projects may follow the approaches defined in Attachment A to Appendix B to Annex II of 4/CMP.1 ("Attachment A") to prove additionality. Herein all CPAs will have to demonstrate the presence of an investment barrier, i.e. a financially more viable alternative to the project activity would have led to higher emissions

Within the CPA-DD template an overview will provided with the main financial parameters as per framework given below. The detailed investment calculation, indicating all assumptions will be provided to the DOE at time of inclusion of the CPA.

In application of the Investment Analysis, an appropriate financial/economic indicator and benchmark will be selected for the programme activity. Project IRR and Equity IRR are considered appropriate financial/economic indicators. The weighted average cost of capital (WACC) and Return on Equity (ROE) are considered suitable benchmarks. The financing data used to calculate the benchmarks will be obtained from public sources.

The investment analysis will be based on the project details considered by the board when approving the investment in the project. Therefore, the inputs to the investment analysis will be considered relevant to the timing of the investment decision.

The CPA-DD-Specific will provide information within the following framework:

Table II.B.5.3 – additionality framework

Step	Description	Application to a typical CPA
1.	Choose a method for demonstrating additionality from the Tool for the demonstration and assessment of additionality.	Step 2 (Investment Analysis) of the Tool for the Demonstration and assessment of additionality, Version 6.0.0 will be applied to a typical CPA.
2.	Apply Benchmark Analysis: Sub Step 2b: Option III of the Tool for the demonstration and assessment of additionality.	Step 2b Option III (Benchmark Analysis) of the Tool for the Demonstration and assessment of additionality, Version 6.0.0 will be applied.
3.	Identify the financial/economic indicator, such as IRR, most suitable for the project type and decision context.	A typical CPA will apply one of the following two financial indicators: (a) Project IRR (b) Equity IRR
4.	Determine financial benchmark	The benchmark for Project IRR is calculated as per Guidance on the Assessment of Investment Analysis and will typically be: (a) Weighted Average Cost of Capital (WACC) (b) commercial bank lending rate A typical benchmark for Equity IRR is: (c) Return on Equity

5.	Present a clear comparison of the financial indicator and the financial benchmark. If the CDM project activity has a less favourable indicator (e.g. lower IRR) than the benchmark, then the CDM project activity cannot be considered as financially attractive.	A typical CPA will have a financial indicator (without CDM) lower than the financial benchmark.
6.	Include a Sensitivity Analysis to show that the conclusions regarding the financial/economic attractiveness are robust to reasonable variations in the critical assumptions. After the sensitivity analysis, it must be concluded that the proposed CDM project activity is unlikely to be financially/economic attractive.	A typical CPA will show through the sensitivity analysis that the conclusion regarding the financial economic attractiveness is robust to reasonable variations in the critical assumptions.
7.	Determine sources of data for calculating the benchmark	Typical sources of financial data for calculating the WACC (Return on Equity and Cost of Debt) are: (a) Return on Equity (ROE) published by the national stock marker for companies that face a similar risk profile to the CPA project. (b) Cost of Debt based commercial lending rates from public sources Typical sources of financial data for Return on Equity are: (c) Return on Equity (ROE) published by for companies that face a similar risk profile to the CPA.

8.	Calculation and comparison of financial indicators	Calculation of the financial indicator identified in step 3 above will apply all the following requirements of the tool: (a) Include all relevant costs (including, for example, the investment cost, the operations and maintenance costs), and revenues (excluding CER revenues, but possibly including inter alia subsidies/fiscal incentives, ODA, etc, where applicable), and, as appropriate, non-market cost and benefits in the case of public investors if this is standard practice for the selection of public investments in the host country. (b) Present the investment analysis in a transparent manner and provide all the relevant assumptions, so that a reader can reproduce the analysis and obtain the same results. Refer to all critical techno-economic parameters and assumptions (such as capital costs, fuel prices, lifetimes, and discount rate or cost of capital). Justify and/or cite assumptions in a manner that can be validated by the DOE. (c) In calculating the financial/economic indicator, the projects risks can be included through the cash flow pattern, subject to project-specific expectations and assumptions (e.g. insurance premiums can be used in the calculation to reflect specific risk equivalents).

Key criteria and data required for assessing the additionality of the CPA are summarised below and provided in the specific CPA-DD. A detailed investment analysis spread sheet will be submitted to the DOE at the time of inclusion of each CPA. Note that items may be added in this section and the respective tables for each CPA, to accommodate a clear and transparent overview of the parameters used for the investment analysis. In each CPA the sources used shall be clearly indicated.

Table II.B.5.4 – investment analysis description

No.	Description	Units	Value	Possible Source
1.	Date of Board Decision/Investment decision	Date	Value to be determined at CPA level.	Company Board Minutes

2.	Yearly Methane Production (Optional)	Nm^3/year		Based on available data at the time of investment decision. This may include one of the following: (a) Third Party Report (i.e. Third Party Yield Analysis, Feasibility Study, etc.) (b) Estimated based on direct site measurements of COD and W/W flow. Together with technology efficiency and conversion factor based on similar plants verified operational records. (c) Historical factory records of operations. Such as production records and ratio of wastewater per production unit measurements. Also COD measurements.
3.	Yearly Electricity Production (Optional)	MWh/ year	Value to be determined at CPA level.	Based on available data at the time of investment decision. This may include one of the following: (a) Third Party Report (i.e. Third Party Yield Analysis, Feasibility Study, etc.) (b) Estimated based on direct site measurements of COD and W/W flow. Together with technology efficiency and conversion factor based on similar plants verified operational records. Heat value of methane and Engine/Generator efficiency. Installed capacity of engine. (c) Historical factory records of operations. Such as production records and ratio of wastewater per production unit measurements. Also COD measurements. Heat value of methane and Engine/Generator efficiency. Installed capacity of engine.
4.	Percentage of Biogas Flared	%	Value to be determined at CPA level.	This may include one of the following: (a) Historical records of similar project structure. (b) Calculated from mismatch in supply/demand (c) Assessment by third party expert
5.	Biogas Sale/Income Price	Project specific	Value to be determined at CPA level.	Will be applied for the specific project: (a) Project biogas sale agreements or equivalent, (b) In the absence of such sale agreement where the project owner is also the biogas consumer, market value of substituted fuel based on historical national (or if unavailable international) prices of fuel that will be substituted. National conversion factors (or if unavailable international) for fuel to be applied.

6.	Electricity Tariff	Project Specific	Value to be determined at CPA level.	(a) If sold to a national grid, based on National Power Regulation framework. (b) If sold directly to a consumer based on the sales agreement (c) In the absence of such sale agreement where the project owner is also the electricity consumer, equivalent tariff that the consumer can buy electricity from the grid.
7.	Escalation of Tariff	%	Value to be determined at CPA level.	This may include one of the following: (a) The sales agreement (b) Based on nation CPI figures
8.	Residual value of equipment	IDR	Value to be determined at CPA level.	This may include one of the following: (a) Based on the contractual agreements for equipment transfer (b) Base on national accounting practices for depreciation, where the equipment is fully depreciated by the end of the lifetime of the asset, the value is zero.
9.	Emission Reductions	tCO_2e	Value to be determined at CPA level.	(a) As estimate in the CPA-DD
10.	CER sale price	€	Value to be determined at CPA level.	This may include one of the following: (a) Historical Prices (b) Third party estimates
11.	Conversion Rate	€/IDR	Value to be determined at CPA level.	This may include one of the following: (a) Bank of Indonesia (b) Other public exchange sources
12.	CPI (O&M escalation rate)	%	Value to be determined at CPA level.	This may include one of the following: (a) Estimates of national CPI (b) Investment Memorandum (c) Escalation as agreed in contract
13.	Percentage of Debt Financing	%	Value to be determined at CPA level.	This may include one of the following: (a) CDM Guidelines Default Value (b) Project Financing Structure (if available at time of investment decision)
14.	Percentage of Equity Financing	%	Value to be determined at CPA level.	This may include one of the following: (a) CDM Guidelines Default value (b) Project Financing Structure (if available at time of investment decision)

15.	Total Investment Cost	IDR	Value to be determined at CPA level.	This may include one of the following: (a) Board Minutes (budget) (b) Third Party Report (i.e. feasibility study) (c) Quotation (d) EPC Contract
16.	Total Operation and Maintenance Cost	IDR	Value to be determined at CPA level.	This may include one of the following: (a) Accounting Records for O&M costs (b) Third Party Report (i.e. feasibility study) (c) Quotation (d) Service Agreement
17.	Operational Lifetime (Supply Period)	Years	Value to be determined at CPA level.	This may include one of the following: (a) Equipment Contracts (b) Feasibility Study (c) Declaration by Equipment Supplier/Consultant
18.	Income tax	%	Value to be determined at CPA level.	This may include one of the following: (a) relevant regulation as published by the government.
19.	Interest rate	%	Value to be determined at CPA level.	This may include one of the following: (a) bank loan agreement (b) latest financing proposal from bank (c) reference rate as published by the bank or central bank.

A typical CPA will have a financial indicator (without CDM) lower than the financial benchmark, in that case the eligibility criteria specified in section B.2 is met. A typical CPA will show through the sensitivity analysis that the conclusion regarding the financial economic attractiveness is robust to reasonable variations in the critical assumptions.

The PoA investment spread sheet template is applied to the CPA to demonstrate that the project is not financially feasible without the revenue from CERs. The outcomes of the financial analysis spread sheet are shown below:

The project returns need to be compared with an appropriate benchmark. Following the "Guidelines on the Assessment of Investment Analysis (Annex 5 of EB 62)" the appropriate benchmark shall be determined for the CPA, with justification.

A table shall be provided in the CPA-DD to clearly explain the outcome of the investment analysis:

Table II.B.5.5 – investment analysis outcome

Financial Parameter	CPA Value
Financial Benchmark	XX%
[Benchmark] without CDM	XX%

The results of the financial analysis spread sheet demonstrate that the project is not financially feasible without the revenue from CERs. The financial analysis is robust to reasonable variations of +10% and -10% in the critical assumptions, as is shown in the table below:

Parameters	Sensitivity		
	-10%	0%	10%
All applicable parameters to be listed here, e.g. power sales, biogas production, investment cost etc.	XX%	XX%	XX%
	XX%	XX%	XX%
	XX%	XX%	XX%
Benchmark	XX%		

An additional analysis shall be conducted to demonstrate at what value each scenario included in the sensitive analysis changes such that the IRR reaches the benchmark. The results are shown in table below which also demonstrates that each of these scenarios is high unlikely to occur.

Scenario	Percentage at which IRR reach benchmark	Likelihood of occurrence
All applicable parameters to be listed here, e.g. power sales, biogas production, investment cost etc.	XX%	An explanation on the likelihood of reaching this variation shall be provided here.
	XX%	An explanation on the likelihood of reaching this variation shall be provided here.
	XX%	An explanation on the likelihood of reaching this variation shall be provided here.

As per paragraph 20 of the "Guidelines on the Assessment of Investment Analysis", EB 62, Annex 5, "Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude),...".

Conclusion

A conclusion shall be provided on the additionality of the specific CPA, including confirmation on the (non) eligible for inclusion as per eligibility criteria specified in the registered PoA-DD.

Documentation relevant to substantiation of the investment barrier shall be provided to the DOE at time of inclusion.

B.6. Estimation of emission reductions of a generic CPA
B.6.1. Explanation of methodological choices
>>

Emission reductions AMS.III.H
A typical CPA may be one of the technological measures as explained in paragraph 1 of the baseline and monitoring methodology AMS-III.H "Methane Recovery in Wastewater Treatment" (version 16). Following are the methodological choices used for calculating emission reductions.

Baseline Emissions
Baseline emissions will include greenhouse gas (GHG) emissions associated with the following sources:

(a) Emissions associated with electricity or fuel consumption in the baseline wastewater treatment system- The CPA will follow the "Tool to calculate baseline, project and/or leakage emissions for electricity consumption" and/or "Tool to calculate project or leakage emissions for fossil fuel combustion" for calculating emissions associated with electricity or fuel consumption.

(b) Emissions associated with baseline wastewater treatment not equipped with a biogas recovery system and which is affected by the project activity treatment system- organic content in the wastewater will be decomposed in the baseline treatment system and would result in generation of methane. Since the baseline wastewater system is not equipped with methane recovery system, it will result in GHG emissions into the atmosphere. Baseline emissions will account for this source of emissions.

(c) Emissions associated with discharge of treated wastewater into sea/river/lake- this is in relation to the amount of chemical oxygen demand (COD) present in the wastewater even after being treated by the baseline wastewater system. If such treated wastewater is discharged to downstream such as sea/river/lake, baseline emissions to account for the un-removed COD in the treated wastewater.

(d) Emissions associated with anaerobic decay of final sludge- if in the baseline scenario, the sludge is allowed to decay under anaerobic conditions it will result in generation of methane which will be emitted into the atmosphere, baseline emissions will account for this source of emissions.

In determining the baseline emissions, past historic records (e.g. COD removal efficiency (CODin and CODout,) of the wastewater treatment systems, the amount of dry matter in sludge, power and electricity consumption per m^3 of wastewater treated, the amount of final sludge generated per tonne of COD removed) of at least one year prior to the project implementation shall be used. If the historical data is not available or for the case of Greenfield projects and capacity addition projects, a baseline measurement campaign should be undertaken for at least 10 days before project implementation. The average values from the measurement campaign shall be multiplied by 0.89 to account for the uncertainty range (30% to 50%) and used for estimating emissions associated with the prevailing baseline. Sludge treatment is not included in this PoA, hence SGR_{BL} and SGR_{PJ} do not need to be determined.

For existing wastewater treatment plant that has been operating for at least three years and if one year of historical data is not available, the procedures described in paragraph 27 of AMS.III.H shall be followed.

For Greenfield and capacity addition projects, procedures described in paragraph 28 of AMS.III.H version 16 shall be followed. The approach (e.g. past historic records, 10-day measurement campaign, value from manufacturer/designer) and the associated data which are selected and applied in determining the baseline emissions shall be recorded under Annex 3 of the CPA-DD.

Emission reductions (ER_y)
Total emission reductions of the CPA will be calculated as a sum of emission reductions from methane recovery in wastewater treatment (technology scenario 1 and 2).

Emission reductions are calculated as follows:
$ER_y = ER_{methane,y}$

Where:
ER_y = Total emission reductions of the project in year y (tCO_2e/year)
$ER_{methane,y}$ = Emission reductions from methane recovery in wastewater treatment in year y (tCO_2e/year)

Below are the methodological choices used for calculating emission reductions baseline and monitoring methodology AMS-III.H "Methane Recovery in Wastewater Treatment" (version 16).

Baseline emissions (AMS-III.H)
Baseline emissions for the systems affected by the project activity may consist of:

(i) Emissions on account of electricity or fossil fuel used ($BE_{power,y}$);

(ii) Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$);

(iii) Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$);

(iv) Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$);

(v) Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$).

Baseline emissions are calculated as follows:

$$BE_{methane,y} = \{BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,dischage,y} + BE_{s,final,y}\}$$

Eq. (1) of AMS-III.H Version 16

Where:

$BE_{methane,y}$	Baseline emissions from methane recovery in wastewater treatment 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* (tCO_2e)
$BE_{ww,dischage,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year *y* (tCO_2e). The value of this term is zero for the case 1 (b)
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year *y* (tCO_2e). If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in the baseline

scenario, this term shall be neglected

i. Emissions on account of electricity or fossil fuel used ($BE_{power,y}$);

$BE_{power,y}$ will be determined as per procedures described in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". $BE_{power,y} = BE_{EC,y}$

$$BE_{EC,y} = \sum_j EC_{BE,k,y} \times EF_{EL,k,y} \times \left(1 + TDL_{k,y}\right)$$ **Eq. 1 of the Tool**[14]

Where:

$BE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2e/yr)
$EC_{BE,k,y}$	Quantity of electricity consumed by the project electricity consumption source k in year y (MWh/yr)
$EF_{EL,k,y}$	Emission factor for electricity generation for source k in year y (tCO_2/MWh)
$TDL_{k,y}$	Average technical transmission and distribution losses for providing electricity to source k in year y

Under scenario A of the tool, option A1 is being used to calculate the CO_2 emission factor of grid electricity. As per scenario A1, the emission factor is the combined margin emission factor of the grid, calculated as per the guidelines provided under the latest version of "Tool to calculate emission factor for an electricity emission".

Scenario B: In case the electricity consumption is from an off-grid captive power plant: The emission factor $EF_{EL,k,y}$ is determined as zero if all equipment/devices in the project treatment facility are powered with power gained from biogas. Else and corresponding to option B2 offered by the tool an emission factor of 0.4 tCO_2e/MWh will be assumed.

Scenario C: In case of baseline electricity consumption from the grid and (a) fossil fuel fired captive power plant(s): The emission factor $EF_{ELk,y}$ is determined according to Scenario A, if the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant or according to Scenario B, if the project activity only affects the quantity of electricity that is supplied from the captive power plant and not the quantity of electricity that is supplied from the grid. Else, i.e. both sources are affected by the project activity, the more conservative value between Scenario A and Scenario B is determined as $EF_{EL,k,y}$. Under current conditions this is the value from Scenario B: $EF_{ELk,y} = 1.3\ tCO_2e/MWh$

General: In the CPA-DD the scenario which applies to the project activity will be clearly described and relevant evidence will be provided to the DOE. In case of doubts the more conservative value among the values of Scenarios A and B shall be adopted.

In line with Scenario B, when all project equipment is powered with power from captured biogas this

[14] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

project emission source can be neglected as long as the electricity export to the grid is the net electricity export or CERs are not claimed for the electricity export.

CPAs of the PoA shall calculate the combined margin emission factor at the time of inclusion and that emission factor shall be fixed ex-ante for the CPA.

For the Average technical transmission and distribution losses for providing electricity to source j in year y($TDL_{k,y}$), CPAs of the PoA shall consider the default value as mentioned in the tool, as a conservative and simplified approach.

ii. Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$);

Methane emissions from the baseline wastewater treatment systems affected by the project ($BE_{ww,treatment,y}$) are determined using the COD removal efficiency of the baseline plant:

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

Eq. (2) of AMS-III.H Version 16

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
$COD_{\inf low,i,y}$	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 26, 27 or 28 below
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems *i* (*MCF* values as per Table III.H.1)
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)[15]
UF_{BL}	Model correction factor to account for model uncertainties (0.89)[16]
GWP_{CH4}	Global Warming Potential for methane (value of 21)

If the baseline treatment system is different from the treatment system in the project scenario, the monitored values of the COD inflow during crediting period will be used to calculate the baseline emissions *ex post*.

[15] Project activities may use the default value of 0.6 kg CH_4/kg BOD, if the parameter $BOD_{5,20}$ is used to determine the organic content of the wastewater. In this case, baseline and project emissions calculations shall use BOD instead of COD in the equations, and the monitoring of the project activity shall be based in direct measurements of $BOD_{5,20}$, i.e. the estimation of BOD values based on COD measurements is not allowed.

[16] Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

iii. Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$);

Methane emissions from the baseline sludge treatment systems affected by the project activity are determined using the methane generation potential of the sludge treatment systems:

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

Eq. (3) of AMS-III.H Version 16

Where:

$S_{j,BL,y}$	Amount of dry matter in the sludge that would have been treated by the sludge treatment system *j* in the baseline scenario (t). For *ex ante* estimation, forecasted sludge generation volume or the designed capacity of the sludge treatment facility can be used. However, the *ex post* emissions reduction calculation shall be based on the actual monitored volume of treated sludge
j	Index for baseline sludge treatment system
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[17] shall be used
$MCF_{s,treatment,BL,j}$	Methane correction factor for the baseline sludge treatment system *j* (*MCF* values as per Table III.H.1)
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)

If the baseline wastewater treatment system is different from the treatment system in the project scenario, the sludge generation rate (amount of sludge generated per unit of COD removed) in the baseline may differ significantly from that of the project scenario. For example, it is known that the amount of sludge generated in aerobic wastewater systems is larger than in anaerobic systems, for the same COD removal efficiency. Therefore, for these cases, the monitored values of the amount of sludge generated during the crediting period will be used to estimate the amount of sludge generated in the baseline, as follows:

$$S_{j,BL,y} = S_{l,PJ,y} * \frac{SGR_{BL}}{SGR_{PJ}}$$

Eq. (5) of AMS-III.H Version 16

Where:

$S_{l,PJ,y}$	Amount of dry matter in the sludge treated by the sludge treatment system *l* in year *y* in the project scenario (t)
SGR_{BL}	Sludge generation ratio of the wastewater treatment plant in the baseline scenario (tonne of dry matter in sludge/t COD removed). This ratio will be determined as per paragraphs 26, 27 or 28 below
SGR_{PJ}	Sludge generation ratio of the wastewater treatment plant in the project scenario (tonne of dry matter in sludge/t COD removed). Calculated using the

[17] The IPCC default values of 0.05 for domestic sludge (wet basis, considering a default dry matter content of 10%) or 0.09 for industrial sludge (wet basis, assuming dry matter content of 35%), were corrected for dry basis.

monitored values of COD removal (i.e. $COD_{inflow,i}$ minus $COD_{outflow,i}$) and sludge generation in the project scenario

iv. Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$);

Methane emissions from degradable organic carbon in treated wastewater discharged in e.g. a river, sea or lake in the baseline situation are determined as follows:

$$BE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,ww} * UF_{BL} * COD_{ww,discharge,BL,y} * MCF_{ww,BL,discharge}$$

Eq. (6) of AMS-III.H Version 16

Where:

$Q_{ww,y}$	Volume of treated wastewater discharged in year *y* (m^3)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
$COD_{ww,discharge,BL,y}$	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the baseline situation in the year *y* (t/m^3). If the baseline scenario is the discharge of untreated wastewater, the COD of untreated wastewater shall be used
$MCF_{ww,BL,discharge}$	Methane correction factor based on discharge pathway in the baseline situation (e.g. into sea, river or lake) of the wastewater (fraction) (*MCF* values as per Table III.H.1)

To determine $COD_{ww,discharge,BL,y}$: if the baseline treatment system(s) is different from the treatment system(s) in the project scenario, the monitored values of the COD inflow during crediting period will be used to calculate the baseline emissions *ex post*. The outflow COD of the baseline systems will be estimated using the removal efficiency of the baseline treatment systems, estimated as per paragraphs 26, 27 or 28 of AMS.III.H.

v. Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$).

Methane emissions from anaerobic decay of the final sludge produced are determined as follows:

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

Eq. (7) of AMS-III.H Version 16

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 above
$MCF_{s,BL,final}$	Methane correction factor of the disposal site that receives the final sludge in the baseline situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
UF_{BL}	Model correction factor to account for model uncertainties (0.89)

If the baseline wastewater treatment system is different from the treatment system in the project scenario, the sludge generation rate (amount of sludge generated per unit of COD removed) in the baseline may differ significantly from that of the project scenario. For example, it is known that the amount of sludge generated in aerobic wastewater systems is larger than in anaerobic systems, for the same COD removal efficiency. Therefore, for these cases, the monitored values of the amount of sludge generated during the crediting period will be used to estimate the amount of sludge generated in the baseline, using equation 5 that is defined above.

Project Activity Emissions (AMS-III.H)

Project activity emissions from the systems affected by the project activity are:

(i) CO_2 emissions from electricity and fuel used by the project facilities ($PE_{power,y}$);

(ii) Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project scenario ($PE_{ww,treatment,y}$);

(iii) Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$);

(iv) Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$);

(v) Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$);

(vi) Methane fugitive emissions due to inefficiencies in capture systems ($PE_{fugitive,y}$);

(vii) Methane emissions due to incomplete flaring ($PE_{flaring,y}$);

(viii) Methane emissions from biomass stored under anaerobic conditions which would not have occurred in the baseline situation ($PE_{biomass,y}$).[18]

The project emissions are calculated using the following equations:

$$PE_{methane,y} = \left\{ \begin{matrix} PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + \\ PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y} \end{matrix} \right\}$$ **Eq. (8) of AMS-III.H Version 16**

Where:

$PE_{methane,y}$ Project activity emissions from methane recovery in wastewater treatment in year y (tCO_2e)

[18] For instance in the baseline situation Palm Kernel Shells (PKS) are used as fuel in a boiler. In the project situation PKS is replaced by biogas captured at a wastewater treatment system. The PKS will no longer be used as fuel in the boiler, but sold on the market. Before it is sold it is likely it will be stored for a period of time (few months or longer) on site which might lead to methane emissions from anaerobic decay.

$PE_{power,y}$ Emissions from electricity or fuel consumption in the year y (tCO_2e). These emissions shall be calculated as per paragraph 19, for the situation of the project scenario, using energy consumption data of all equipment/devices used in the project activity wastewater and sludge treatment systems and systems for biogas recovery and flaring/gainful use

$PE_{ww,treatment,y}$ Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (tCO_2e). These emissions shall be calculated as per equation 2 in paragraph 20, 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:

$MCF_{ww,treatment,PJ,k}$	Methane correction factor for project wastewater treatment system k (MCF values as per Table III.H.1)
$\eta_{,PJ,k,}$	Chemical oxygen demand removal efficiency of the project wastewater treatment system k in year y (t/m^3), measured based on inflow COD and outflow COD in system k

$PE_{s,treatment,y}$ Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (tCO_2e). These emissions shall be calculated as per equations 3 and 4 in paragraph 22, 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:

$S_{l,PJ,y}$	Amount of dry matter in the sludge treated by the sludge treatment system l in the project scenario in year y (t)
$MCF_{s,treatment,l}$	Methane correction factor for the project sludge treatment system l (MCF values as per Table III.H.1)

$PE_{ww,discharge,y}$ Methane emissions from degradable organic carbon in treated wastewater in year y (tCO_2e). These emissions shall be calculated as per equation 6 in paragraph 24, 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:

$COD_{ww,discharge,PJ,y}$	Chemical oxygen demand of the treated wastewater discharged into 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 sea, river or lake) (MCF values as per Table III.H.1)

$PE_{s,final,y}$ Methane emissions from anaerobic decay of the final sludge produced in year y (tCO_2e). These emissions shall be calculated as per equation 7 in paragraph 25, 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:

$MCF_{s,PJ,final}$	Methane correction factor of the disposal site that receives the final sludge in the project situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
$S_{final,PJ,y}$	Amount of dry matter in final sludge generated by the project wastewater treatment systems in the year y (t)

$PE_{fugitive,y}$ Methane emissions from biogas release in capture systems in year y, calculated as per paragraph 30 (tCO_2e)

$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year *y* (tCO_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 CH4. However, the *ex post* emission reduction shall be calculated as per the"Tool to determine project emissions from flaring gases containing methane" by using actual monitored data
$PE_{biomass,y}$	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 "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (tCO_2e)

(i) **CO_2 emissions from electricity and fuel used by the project facilities ($PE_{power,y}$);**

$PE_{power,y}$ Emissions from electricity or fuel consumption in the year *y* (tCO_2e). These emissions will be calculated as per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

<u>Project emissions from electricity consumption</u>

A typical CPA of the PoA will consume electricity at the project site to run various equipment. The emission on the account of electricity ($PE_{power,y} = PE_{EC,y}$)consumption has been designed to calculate in accordance with the "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01).

The tool is applicable if one out of the following three scenarios applies to the sources of electricity consumption:

- Scenario A: Electricity consumption from the grid
- Scenario B: Electricity consumption from (an) off grid fossil fuel fired captive power plant
- Scenario C: Electricity consumption from the grid and fossil fuel fired captive power plant.

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times \left(1 + TDL_{j,y}\right)$$ **Eq. 1 of the Tool**[19]

Where:

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2e/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)

[19] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

Under scenario A of the tool, option A1 is being used to calculate the CO_2 emission factor of grid electricity. As per scenario A1, the emission factor is the combined margin emission factor of the grid, calculated as per the guidelines provided under the latest version of "Tool to calculate emission factor for an electricity emission".

Scenario B: In case the electricity consumption is from an off-grid captive power plant: The emission factor $EF_{EL,j,y}$ is determined as zero if all equipment/devices in the project treatment facility are powered with power gained from biogas. Else and corresponding to option B2 offered by the tool an emission factor of 0.4 tCO_2e/MWh will be assumed.

Scenario C: In case of baseline electricity consumption from the grid and (a) fossil fuel fired captive power plant(s): The emission factor $EF_{EL,j,y}$ is determined according to Scenario A, if the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant or according to Scenario B, if the project activity only affects the quantity of electricity that is supplied from the captive power plant and not the quantity of electricity that is supplied from the grid. Else, i.e. both sources are affected by the project activity, the more conservative value between Scenario A and Scenario B is determined as $EF_{EL,j,y}$. Under current conditions this is the value from Scenario B: $EF_{EL,j,y} = 1.3\ tCO_2e/MWh$

General: In the CPA-DD the scenario which applies to the project activity will be clearly described and relevant evidence will be provided to the DOE. In case of doubts the more conservative value among the values of Scenarios A and B shall be adopted.

In line with Scenario B, when all project equipment is powered with power from captured biogas this project emission source can be neglected as long as the electricity export to the grid is the net electricity export or CERs are not claimed for the electricity export.
CPAs of the PoA shall calculate the combined margin emission factor at the time of inclusion and that emission factor shall be fixed ex-ante for the CPA.

For the Average technical transmission and distribution losses for providing electricity to source j in year y($TDL_{j,y}$), CPAs of the PoA shall consider the default value as mentioned in the tool, as a conservative and simplified approach.

Fossil fuel usage

It is possible that fossil fuel is used in the project. In such cases relevant emissions shall be determined In case any electricity is generated using "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

Since fossil fuel (diesel, coal or FO) may be consumed CO_2 emission from fossil fuel combustion ($PE_{FC,y}$) should be calculated using the latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" Version 02 (EB 41, Annex 11). According to this Tool, 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:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad (1)^{20}$$

Where

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during year *y*(t CO_2e/yr)
$FC_{i,j,y}$	Is the quantity of fuel type *i* combusted in process *j* during year *y* (mass or volume unit/year)
$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *j*(t CO_2/mass or volume unit)
i	Are the fuel types combusted in process *j* during the year *y*

As the data on the chemical composition of the fossil fuel type *i* used by the CPA is not available. Thus, the option B of the Tool is adopted for calculation of the CO_2 emission coefficient $COEF_{i,y}$. The $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i* , as follows:

$$COEF_{i,y} = NCV_{i,y} \text{ x } EF_{CO2,i,y} \quad (4)^{21}$$

Where:

$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *y*(t CO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (t CO_2/GJ)
i	Are the fuel types combusted in process *j* during the year *y*

Fossil fuel consumption will be estimated ex-ante based on parameters available in the feasibility study report or a declaration from the technology supplier of each CPA. Actual fossil fuel consumption will be part of the monitoring plan of each CPA.

(ii) **Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project scenario ($PE_{ww,treatment,y}$);**

$PE_{ww,treatment,y}$ Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y* (tCO_2e). These emissions shall be calculated as per equation 2 in paragraph 20, 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:

$MCF_{ww,treatment,PJ,k}$	Methane correction factor for project wastewater treatment system *k* (*MCF* values as per Table III.H.1)
$\eta_{,PJ,k,}$	Chemical oxygen demand removal efficiency of the project wastewater treatment system *k* in year *y* (t/m^3), measured based on inflow COD and outflow COD in system *k*

(iii) **Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$);**

$PE_{s,treatment,y}$ Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y* (tCO_2e). These emissions shall be

[20] Tool to calculate project or leakage CO2 emissions from fossil fuel combustion

[21] Tool to calculate project or leakage CO2 emissions from fossil fuel combustion

calculated as per equations 3 and 4 in paragraph 22, 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:

$S_{l,PJ,y}$	Amount of dry matter in the sludge treated by the sludge treatment system *l* in the project scenario in year *y* (t)
$MCF_{s,treatment,l}$	Methane correction factor for the project sludge treatment system l (*MCF* values as per Table III.H.1)

(iv) **Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$);**

$PE_{ww,discharge,y}$ Methane emissions from degradable organic carbon in treated wastewater in year *y* (tCO_2e). These emissions shall be calculated as per equation 6 in paragraph 24, 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:

$COD_{ww,discharge,PJ,y}$	Chemical oxygen demand of the treated wastewater discharged into 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 sea, river or lake) (*MCF* values as per Table III.H.1)

(v) **Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$);**

$PE_{s,final,y}$ Methane emissions from anaerobic decay of the final sludge produced in year *y* (tCO_2e). These emissions shall be calculated as per equation 7 in paragraph 25, 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:

$MCF_{s,PJ,final}$	Methane correction factor of the disposal site that receives the final sludge in the project situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
$S_{final,PJ,y}$	Amount of dry matter in final sludge generated by the project wastewater treatment systems in the year *y* (t)

(vi) **Methane fugitive emissions due to inefficiencies in capture systems ($PE_{fugitive,y}$);**

Project activity emissions from methane release in capture systems are determined as follows:

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

$$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$$ **Eq. (9) of AMS-III.H Version 16**

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* (tCO_2e)

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

Eq. (10) of AMS-III.H Version 16

Where:

CFE_{ww} Capture efficiency of the biogas recovery equipment in the wastewater treatment systems (a default value of 0.9 shall be used)

$MEP_{ww,treatment,y}$ Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year *y* (t)

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

Eq. (11) of AMS-III.H Version 16

Where:

$COD_{removed,PJ,k,y}$ The chemical oxygen demand removed[22] 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 (*MCF* values as per Table III.H.1)

UF_{PJ} Model correction factor to account for model uncertainties (1.12)

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

Eq. (12) of AMS-III.H Version 16

Where:

CFE_s Capture efficiency of the biogas recovery equipment in the sludge treatment systems (a default value of 0.9 shall be used)

$MEP_{s,treatment,y}$ Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year *y* (t)

$$MEP_{s,treatment,y} = \sum_{l} (S_{l,PJ,y} * MCF_{s,treatment,PJ,l}) * DOC_s * UF_{PJ} * DOC_F * F * 16/12$$

Eq. (13) of AMS-III.H Version 16

Where:

$S_{l,PJ,y}$ Amount of sludge treated in the project sludge treatment system *l* equipped with a biogas recovery system (on a dry basis) in year *y* (t)

$MCF_{s,treatment,PJ,l}$ Methane correction factor for the sludge treatment system equipped with biogas recovery equipment (*MCF* values as per Table III.H.1)

UF_{PJ} Model correction factor to account for model uncertainties (1.12)

---

22 Difference between the inflow COD and the outflow COD.

(b) Optionally a default value of 0.05 m³ biogas leaked/m³ biogas produced may be used as an alternative to calculations per equation 9 to 13.

(vii) **Methane emissions due to incomplete flaring ($PE_{flaring,y}$);**

For *ex ante* estimation, baseline emission calculation for wastewater and can be used but without the consideration of GWP for CH_4:

The ex ante estimation

$$PE_{flaring,y} = \sum_i (Q_{ww,i,y} * COD_{inflow,i,y} * \eta_{COD,BL,i} * MCF_{ww,treatment,BL,i}) * B_{o,ww} * UF_{BL}$$

Eq. (12) of AMS-III.H Version 16

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 26, 27 or 28 below
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems *i* (*MCF* values as per Table III.H.1)
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)

For CPA that plan to utilize biogas completely for combustion for electricity generation in the project activiy, then the $PE_{flaring}$ will be considered as zero for ex-ante emission reduction. s The *ex post* emission reduction will be calculated as per "Tool to determine project emissions from flaring gases containing methane" by using actual monitored data.

$PE_{flaring,y}$ Methane emissions due to incomplete flaring. The *ex post* emission reduction will be calculated as per "Tool to determine project emissions from flaring gases containing methane" by using actual monitored data.

Note that either a open or enclosed flare may be employed by the CPA.

Methane may be released as a result of incomplete combustion in the flare. To calculate project emissions from flaring of the biogas (PE_{flare}), the "Tool to determine project emissions from flaring gases containing methane" (version 01 approved at EB28) is applied.

For determination of the flare efficiency, a default value of 50% will be used for the calculation of project emissions from flaring gases if the CPA uses an open flare and a default flare efficiency of 90% will be employed if the CPA uses an enclosed flare.

The tool specifies 7 steps for calculation.

Step 1: Determination of the mass flow rate of the residual gas that is flared

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas.

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas. Alternatively, the tool provides a simplified approach to only measure the volumetric fraction of methane and to consider the deference to 100% as being nitrogen. The proposed project activity adopts this simplified approach.

Step 2 is not applicable because of the simplified approach taken where only the volumetric fraction of methane is measured.

Steps 3 & 4 are only applicable if the combustion efficiency of the flare is continuously monitored and are therefore not considered.

Step 5: Determination of methane mass flow rate in the residual gas on a dry basis

The quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions (normal conditions and dry or wet basis).

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n}$$ **Eq. 13 of Flaring Tool Version 01**

Where:

Parameter	Description	Unit
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour *h*	kg/h
$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour *h*	m^3/h
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the residual gas on dry basis in hour *h*	mg/m^3
$\rho_{CH4,n}$	Density of methane at normal conditions	kg/m^3

Step 6: Determination of the hourly flare efficiency

In case the project uses an open flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the flame is not detected for more than 20 minutes during the hour *h*.
- 50%, if the flare is detected for more than 20 minutes during the hour *h*.

In case the project uses an enclosed flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour *h* .
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h*, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour *h*.
- 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h* and the manufacturer's specifications on proper operation of the flare are met continuously during the hour *h*.

Step 7: Calculation of annual project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions from each hour *h*, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour *h* ($\rho_{flare,h}$), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times \left(1-\eta_{flare,h}\right) \times \frac{GWP_{CH4}}{1000}$$ **Eq. 15 of Flaring Tool Version 01**

Where:

Parameter	Description	Unit
$PE_{flare,y}$	Project emissions from flaring of the residual gas stream in year *y*	tCO_2e/yr
$TM_{RG,h}$	Mass flow rate of the methane in the residual gas in the hour *h*	kg/h
$\eta_{flare,h}$	Flare efficiency in hour *h*	fraction

(viii) **Methane emissions from biomass stored under anaerobic conditions which would not have occurred in the baseline situation ($PE_{biomass,y}$).**[23]

$PE_{biomass,y}$ Methane emissions from biogas 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 the biomass will be considered and be determined as per the procedure in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (tCO_2e)

Leakage (AMS-III.H)

If the technology is using equipment transferred from another facility, leakage effects at the site of the other activity are to be considered and estimated ($LE_{methane,y}$).

For programme of activities:

[23] For instance in the baseline situation Palm Kernel Shells (PKS) are used as fuel in a boiler. In the project situation PKS is replaced by biogas captured at a wastewater treatment system. The PKS will no longer be used as fuel in the boiler, but sold on the market. Before it is sold it is likely it will be stored for a period of time (few months or longer) on site which might lead to methane emissions from anaerobic decay.

In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.

Emission reductions ($ER_{methane,y}$) (AMS-III.H)

Emission reductions shall be estimated *ex ante* as follows:

$$ER_{methane,y,ex\,ante} = BE_{methane,y,ex\,ante} - \left(PE_{methane,y,ex\,ante} + LE_{methane,y,ex\,ante}\right)$$

Eq. (14) of AMS-III.H Version 16

Where:

$ER_{methane,y,ex\,ante}$	*Ex ante* emission reduction in year *y* (tCO_2e)
$LE_{methane,y,ex\,ante}$	*Ex ante* leakage emissions in year *y* (tCO_2e)
$PE_{methane,y,ex\,ante}$	*Ex ante* project emissions in year *y* calculated as paragraph 29 (tCO_2e)
$BE_{methane,y,ex\,ante}$	*Ex ante* baseline emissions in year *y* calculated as per paragraph 18 (tCO_2e)

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

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

For cases 1 (b), 1 (c), 1 (d) and 1 (f): it is possible that the project activity involves wastewater and sludge treatment 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 the actual monitored data for the project activity. The emission reductions achieved in any year are the lowest value of the following:

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

Eq. (15) of AMS-III.H Version 16

Where:

$ER_{methane,y,ex\,post}$	Emission reductions achieved by the project activity based on monitored values for year *y* (tCO_2e)
$BE_{methane,y,ex\,post}$	Baseline emissions calculated as per paragraph 18 using *ex post* monitored values
$PE_{methane,y,ex\,post}$	Project emissions calculated as per paragraph 29 using *ex post* monitored values
MD_y	Methane captured and destroyed/gainfully used by the project activity in the year *y* (tCO_2e)

In the case of flaring/combustion MD_y will be measured using the conditions of the flaring process:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4}$$ **Eq. (16) of AMS-III.H Version 16**

Where:

$BG_{burnt,y}$	Biogas[24] flared/combusted in year *y* (m^3)
$w_{CH4,y}$	Methane content[13] 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% may be applied

For the cases listed in paragraph 1 such as:

Substitution of an aerobic wastewater or sludge treatment system with an anaerobic treatment system with methane recovery and combustion; and

Introduction of an anaerobic wastewater treatment system with methane recovery and combustion to an untreated wastewater stream.

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.

$$ER_{methane,y} = BE_{methane,y,ex\ post} - \left(PE_{methane,y,ex\ post} + LE_{methane,y,ex\ post}\right)$$

Eq. (17) of AMS-III.H Version 16

The historical records of electricity and fuel consumption, the COD content of untreated and treated wastewater, and the quantity of sludge produced by the replaced units will be used for the baseline calculation.

In case (a), if the volumetric flow and the characteristic properties (e.g. COD) of the inflow and outflow of the wastewater are equivalent in the project and the baseline scenarios (i.e. the project and baseline systems have the same efficiency for COD removal for wastewater treatment), then the higher energy consumption and sludge generation in the baseline scenario are the only significant differences contributing to emissions reductions in the project case. In this case, the emission reductions can be calculated as the difference between the historical energy consumption of the replaced unit and the recorded energy consumption of the new system, plus the difference in emissions from sludge treatment and/or disposal. Project emissions from fugitive emissions and incomplete flaring ($PE_{fugitive,y}$, $PE_{flaring,y}$) shall also be considered in the calculation of the emission reductions, however the emissions from the wastewater outflow and sludge ($PE_{ww,discharge,y}$, $PE_{s,final,y}$) may be disregarded, if they are equivalent in the baseline and project scenarios.

B.6.2. Data and parameters that are to be reported ex-ante

[24] Biogas volume and methane content measurements shall be on the same basis (wet or dry).

Data / Parameter	$MCF_{ww,treatment,BL,i}$
Unit	-
Description	Methane correction factor for baseline wastewater treatment system *i*
Source of data	Table III.H.1 of AMS-III.H (version 16)
Value(s) applied	Will be based on type of the wastewater treatment system in the baseline scenario of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$B_{o,ww}$
Unit	kg CH_4/kg COD
Description	Methane producing capacity of the wastewater
Source of data	Paragraph 20 of AMS-III.H (version 16)
Value(s) applied	0.25
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	UF_{BL}
Unit	-
Description	Model correction uncertainty factor to account for model uncertainties
Source of data	AMS-III.H (version 16) paragraph 20
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	-

Data / Parameter	GWP_{CH4}
Unit	-
Description	Global warming potential of methane
Source of data	IPCC value as in AMS-III.H (version 16) paragraph 20
Value(s) applied	21
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the baseline emission. The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	DOC_s
Unit	-
Description	Degradable organic content of the untreated sludge generated in the year *y* (fraction, dry basis).
Source of data	Default value as per paragraph 22 of AMS-III.H version 16
Value(s) applied	Wet basis: 0.09 Dry basis: 0.257
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology. The wastewater considered in this PoA is industrial wastewater.
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	DOC_F
Unit	-
Description	Fraction of DOC dissimilated to biogas
Source of data	IPCC default value as per paragraph 22 of AMS-III.H version 16
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission. The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	F
Unit	-
Description	Fraction of CH_4 in biogas
Source of data	IPCC default value as per paragraph 22 of AMS-III.H version 16
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission. The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$MCF_{ww,BL,discharge}$**
Unit	-
Description	Methane correction factor based on the discharge pathway in the baseline situation (e.g. into sea, river or lake) of the wastewater
Source of data	Values from Table III.H.1 of AMS-III.H version 16
Value(s) applied	Will be based on type of the discharge pathway in the baseline wastewater treatment system of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$COD_{ww,discharge,BL,y}$**
Unit	t/m^3
Description	Chemical oxygen demand of treated wastewater discharged into sea, river or lake
Source of data	To be determined in accordance with paragraph 26, 27 or 28 of the baseline and monitoring methodology.
Value(s) applied	To be determined based on nature of CPA.
Choice of data or Measurement methods and procedures	[Where values are based on measurement, include a description of the measurement methods and procedures applied (e.g. which standards have been used), indicate the responsible person/entity that undertook the measurement, the date of the measurement and the measurement results. This information shall be indicated at CPA level for each specific CPA]
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$MCF_{s,BL,final}$**
Unit	-
Description	Methane correction factor of the disposal site that receives the final sludge in the baseline situation.
Source of data	Estimated as per procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Value(s) applied	Will be based on type of sludge disposal site in the baseline scenario of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$\eta_{COD,BL,i}$**
Unit	%
Description	COD removal efficiency of the baseline treatment system *i*.
Source of data	To be determined in accordance with paragraph 26, 27 or 28 of the baseline and monitoring methodology.
Value(s) applied	To be determined for each CPA
Choice of data or Measurement methods and procedures	[Where values are based on measurement, include a description of the measurement methods and procedures applied (e.g. which standards have been used), indicate the responsible person/entity that undertook the measurement, the date of the measurement and the measurement results. This information shall be indicated at CPA level for each specific CPA]
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$S_{final,BL,y}$
Unit	t
Description	Amount of dry matter in the sludge
Source of data	Measurement by CPA implementer
Value(s) applied	To be determined for each CPA
Choice of data or Measurement methods and procedures	To be determined for each CPA
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	DF
Unit	-
Description	10-day measurement campaign factor to account for the uncertainty range (30% to 50%)
Source of data	As per AMS-III.H (version 16) paragraph 27
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline monitoring methodology
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$MCF_{ww,treatment\ PJ,k}$
Unit	-
Description	Methane correction factor for project wastewater treatment system *k*
Source of data	Table III.H.1 of AMS-III.H version 16 or Table 6.8 of Volume 5 Chapter 6 IPCC 2006 Guideline
Value(s) applied	Will be based on type of wastewater treatment of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$MCF_{ww,treatment\ PJ,i}$
Unit	-
Description	Methane correction factor for project wastewater treatment systems i
Source of data	Table III.H.1 of AMS-III.H version 16 or Table 6.8 of Volume 5 Chapter 6 IPCC 2006 Guideline
Value(s) applied	Will be based on type of wastewater treatment of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	UF_{PJ}
Unit	-
Description	Model correction to account for model uncertainties
Source of data	AMS-III.H (version 16) paragraph 29
Value(s) applied	1.12
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$MCF_{ww,PJ,discharge}$**
Unit	-
Description	Methane correction factor based on the discharge pathway of the wastewater in the project scenario (e.g. into sea, river or lake)
Source of data	Table III.H.1. of AMS-III.H version 16
Value(s) applied	Will be based on the discharge pathway of wastewater treatment system of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	

Data / Parameter	**$MCF_{s,PJ,final}$**
Unit	-
Description	Methane correction factor of disposal site that receives the final sludge in the project situation.
Source of data	Estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Value(s) applied	Will be based on the sludge disposal site in the project scenario of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**CFE_{ww}**
Unit	-
Description	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems
Source of data	Default value as per paragraph 30 of AMS-III.H version 16
Value(s) applied	0.9
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$\eta_{COD,PJ,j}$**
Unit	%
Description	COD removal efficiency of the project treatment system *j*.
Source of data	The COD removal efficiency is obtained from the supplier of the technology.
Value(s) applied	Will be based on the technology installed in the CPA
Choice of data or Measurement methods and procedures	[Where values are based on measurement, include a description of the measurement methods and procedures applied (e.g. which standards have been used), indicate the responsible person/entity that undertook the measurement, the date of the measurement and the measurement results. This information shall be indicated at CPA level for each specific CPA]
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$\rho_{CH4,n,h}$
Unit	kg/m3
Description	Density of methane at normal conditions
Source of data	“Tool to determine project emissions from flaring gases containing methane”
Value(s) applied	0.716
Choice of data or Measurement methods and procedures	default value from the “Tool to determine project emissions from flaring gases containing methane” is applied. Stated on page 12 of the Tool.
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

B.6.3. Ex-ante calculations of emission reductions

>>

Emission reductions (ER_y)

Total emission reductions of the CPA will be calculated as a sum of emission reductions from methane recovery in wastewater treatment (technology scenario 1 and 2) and optionally emission reduction obtained through combustion of recovered methane for electricity generation (scenario E).

Emission reductions are calculated as follows:

$ER_y = ER_{methane,y}$

Where:

ER_y = Total emission reductions of the project in year y (tCO_2e/year)

$ER_{methane,y}$ = Emission reductions from methane recovery in wastewater treatment in year y (tCO_2e/year)

Below are the methodological choices used for calculating emission reductions baseline and monitoring methodology AMS-III.H "Methane Recovery in Wastewater Treatment" (version 16).

Baseline emissions (AMS-III.H)

This section provides methodological choices for all baseline emission sources. Depending on the selected choices baseline in the table below, relevant equations and monitoring parameters shall be selected. In case an emission source has been excluded, the respective calculations need not to be completed.

Baseline emissions are calculated as follows:

$$BE_{methane,y} = \{BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,dischage,y} + BE_{s,final,y}\}$$

Eq. (1) of AMS-III.H Version 16

Where:

Provide explanation in case the emission source is excluded and indicate respective emissions as 0.

Included?	Parameter	Explanation	Value	Unit
	$BE_{methane,y}$	Baseline emissions from methane recovery in wastewater treatment in year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year *y*.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year *y*. Provide explanation in case the emission source is excluded.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$BE_{ww,dischage,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year *y*. Provide explanation in case the emission source is excluded.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year *y*. Provide	[Value]	tCO_2e/yr

		explanation in case the emission source is excluded.		

vi. Emissions on account of electricity or fossil fuel used (BE $_{power,y}$);

[In case this baseline source is excluded/disregarded: Therefore: **BE $_{power,y}$** = 0 tCO_2e]

[In case this baseline source is included: The emissions are calculated according to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO 2 emissions from fossil fuel combustion" as follows: $BE_{power,y}$ will be determined as per procedures described in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". In case emissions due to the usage of electricity in the baseline are claimed:

$BE_{power,y}$ will be determined as per procedures described in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". $BE_{power,y} = BE_{EC,y}$

$$BE_{EC,y} = \sum_j EC_{BE,k,y} \times EF_{EL,k,y} \times \left(1 + TDL_{k,y}\right)$$ **Eq. 1 of the Tool**[25]

Where:

Parameter	Description	Value	Unit
$BE_{EC,y}$	Project emissions from electricity consumption in year y	[Value]	tCO_2e/yr
$EC_{BE,k,y}$	Quantity of electricity consumed by the project electricity consumption source k in year y	[Value]	MWh/yr
$EF_{EL,k,y}$	Emission factor for electricity generation for source k in year y	[Value]	(tCO_2/MWh)
$TDL_{k,y}$	Average technical transmission and distribution losses for providing electricity to source k in year y	[Value]	%

Description of the determination for the emission factor $EF_{EL,k,y}$ and for the Average technical transmission and distribution losses for providing electricity to source j in year y($TDL_{k,y}$), CPAs of the PoA shall consider the default value as mentioned in the tool and provide justification here.

vii. Methane emissions from baseline wastewater treatment systems (BE $_{ww,treatment,y}$);

Methane emissions from the baseline wastewater treatment systems affected by the project ($BE_{ww,treatment,y}$) are determined using the COD removal efficiency of the baseline plant. The baseline for the CPA is [description of the baseline. As such baseline emissions are calculated as follows:

[25] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

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

Eq. (2) of AMS-III.H Version 16

Where:

Parameter	Description	Value	Unit
$BE_{ww,treatment,y}$	Methane emissions from baseline wastewater treatment systems	[Value]	tCO_2e/yr
$Q_{ww,i,y}$	Volume of wastewater treated in baseline wastewater treatment system *i* in year *y*.	[Value]	m^3
$COD_{inf\,low,i,y}$	Chemical oxygen demand of the wastewater inflow to the baseline treatment system *i* in year *y*.	[Value]	t/m^3
$\eta_{COD,BL,i}$	COD removal efficiency of the baseline treatment system *i*,	[Value]	%
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems *i*	[Value]	-
i	Index for baseline wastewater treatment system	-	-
$B_{o,ww}$	Methane producing capacity of the wastewater	0.25	$kgCH_4/kg$ COD
UF_{BL}	Model correction factor to account for model uncertainties	0.89	-
GWP_{CH4}	Global Warming Potential for methane	21	tCO_2e/tCH_4

Please refer to section B.6.1 how to determine the CODin and CODout for the appropriate project scenario's

viii. Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$);

Methane emissions from the baseline sludge treatment systems affected by the project activity are determined using the methane generation potential of the sludge treatment systems:

[In case this baseline source is excluded/disregarded: Therefore: $BE_{s,treatment,y}$ = 0 tCO_2e]

ix. Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$);

Methane emissions from degradable organic carbon in treated wastewater discharged in e.g. a river, sea or lake in the baseline situation are determined as follows:

$$BE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,ww} * UF_{BL} * COD_{ww,discharge,BL,y} * MCF_{ww,BL,discharge}$$

Eq. (6) of AMS-III.H Version 16

Where:

Parameter	Description	Value	Unit
$BE_{ww,discharge,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity	[Value]	tCO_2e/yr
$Q_{ww,y}$	Volume of treated wastewater discharged in year *y*	[Value]	m^3
GWP_{CH4}	Global Warming Potential of methane	0.21	tCO_2e/tCH_4
$Bo_{,WW}$	Methane producing capacity of the wastewater	0.25	$kgCH_4/kg$ COD
UF_{BL}	Model correction factor to account for model uncertainties	0.89	-
$COD_{ww,discharge,BL,y}$	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the baseline situation in the year *y*	[Value]	t/m^3
$MCF_{ww,BL,discharge}$	Methane correction factor based on discharge pathway in the baseline situation (e.g. into sea, river or lake) of the wastewater	[Value]	-

To determine $COD_{ww,discharge,BL,y}$: if the baseline treatment system(s) is different from the treatment system(s) in the project scenario, the monitored values of the COD inflow during crediting period will be used to calculate the baseline emissions *ex post*. The outflow COD of the baseline systems will be estimated using the removal efficiency of the baseline treatment systems, estimated as per paragraphs 26, 27 or 28 of AMS.III.H. A description of this will be provided here and if applicable also in annex 3 of the CPA-DD.

x. Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$).

Methane emissions from anaerobic decay of the final sludge produced are determined as follows:

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

Eq. (7) of AMS-III.H Version 16

Where:

Parameter	Description	Value	Unit
$BE_{s,final,y}$	Methane emissions from the decay of the final sludge generated by the baseline treatment systems	[Value]	tCO_2e/yr
$S_{final,BL,y}$	Amount of dry matter in the final sludge generated by the baseline wastewater treatment systems in the year *y* (t).	[Value]	t
$MCF_{s,BL,final}$	Methane correction factor of the disposal site that receives the final sludge in the baseline situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"	[Value]	-
UF_{BL}	Model correction factor to account for model uncertainties	0.89	-
DOC_F	Fraction of DOC dissimulated to biogas	0.5	tCH_4/t DOC

F	Fraction of CH4 in biogas	0.5	-
GWP_{CH4}	Global Warming Potential of methane	21	tCO_2e/tCH_4

If the baseline wastewater treatment system is different from the treatment system in the project scenario, the sludge generation rate (amount of sludge generated per unit of COD removed) in the baseline may differ significantly from that of the project scenario. For example, it is known that the amount of sludge generated in aerobic wastewater systems is larger than in anaerobic systems, for the same COD removal efficiency. Therefore, for these cases, the monitored values of the amount of sludge generated during the crediting period will be used to estimate the amount of sludge generated in the baseline, as follows:

$$S_{j,BL,y} = S_{l,PJ,y} * \frac{SGR_{BL}}{SGR_{PJ}}$$ **Eq. (5) of AMS-III.H Version 16**

Parameter	Description	Value	Unit
$S_{j,BL,y}$	Baseline quantity of dry matter in sludge	[Value]	t dry matter
$S_{l,PJ,y}$	Project quantity of dry matter in sludge	[Value]	t dry matter
SGR_{BL}	Sludge generation ratio of the wastewater treatment plant in the baseline scenario	[Value]	t of dry matter/t COD removed
SGR_{PJ}	Sludge generation ratio of the wastewater treatment plant in the project scenario	[Value]	t of dry matter/t COD removed

Project Activity Emissions (AMS-III.H)

The project emissions are calculated using the following equations:

$$PE_{methane,y} = \left\{ \begin{matrix} PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + \\ PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y} \end{matrix} \right\}$$ **Eq. (8) of AMS-III.H Version 16**

Where:

Included?	Parameter	Description	Value	Unit
	$PE_{methane,y}$	Project activity emissions from methane recovery in wastewater treatment in the year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{power,y}$	Emissions from electricity or fuel consumption in the year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{ww,treatment,y}$	Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{s,treatment,y}$	Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y*.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{ww,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater in year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge produced in year *y*.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year *y*.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{biomass,y}$	Methane emissions from biomass stored under anaerobic conditions	[Value]	tCO_2e/yr

Provide an explanation if certain emission sources are not included.

(ix) **CO_2 emissions from electricity and fuel used by the project facilities ($PE_{power,y}$);**

$PE_{power,y}$ Emissions from electricity or fuel consumption in the year *y* (tCO_2e). These emissions will be calculated as per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

A typical CPA of the PoA will consume electricity at the project site to run various equipment. The emission on the account of electricity ($PE_{power,y} = PE_{EC,y}$)consumption has been designed to calculate in accordance with the "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01).

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$$ **Eq. 1 of the Tool**[26]

Where:

Parameter	Description	Value	Unit
$PE_{EC,y}$	Project emissions from electricity consumption in year y	[Value]	tCO_2e/yr
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y	[Value]	MWh/yr
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y	[Value]	tCO_2/MWh

[26] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y	[Value]	-

In case electricity is generated with biogas:

$PE_{power,y}$ = 0 tCO_2e

Description of the determination for the emission factor $EF_{EL,j,y}$ and for the Average technical transmission and distribution losses for providing electricity to source j in year y(TDL_{jy}), CPAs of the PoA shall consider the default value as mentioned in the tool and provide justification here.

Fossil fuel consumption

Since fossil fuel (diesel, coal or FO) may be CO_2 emission from fossil fuel combustion ($PE_{FC,y}$) should be calculated using the latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" Version 02 (EB 41, Annex 11). According to this Tool, 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:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad (1)^{27}$$

Where

Parameter	Description	Value	Unit
$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during year *y*	[Value]	(t CO_2e/yr)
$FC_{i,j,y}$	Is the quantity of fuel type *i* combusted in process *j* during year *y*	[Value]	(mass or volume unit/year)
$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *j*	[Value]	(t CO_2/mass or volume unit)
i	Are the fuel types combusted in process *j* during the year *y*	[Value]	

Table E.6.2.4

As the data on the chemical composition of the fossil fuel type *i* used by the project activity is not available. Thus, the option B of the Tool is adopted for calculation of the CO_2 emission coefficient $COEF_{i,y}$. The $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i* , as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad (4)$$

Where:

Parameter	Description	Value	Unit
$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *y*	[Value]	(t CO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type *i* in year *y*	[Value]	(GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type *i*	[Value]	(t CO_2/GJ)

[27] Tool to calculate project or leakage CO2 emissions from fossil fuel combustion

	in year *y*		
i	Are the fuel types combusted in process *j* during the year *y*	[Value]	Type

Table E.6.2.5

Fossil fuel consumption will be estimated ex-ante based on parameters available in the feasibility study report or a declaration from the technology supplier of each CPA. Actual fossil fuel consumption will be part of the monitoring plan of each CPA.

(x) **Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project scenario ($PE_{ww,treatment,y}$);**

As described above the project activity affects systems of the baseline wastewater treatment plant. This thus is thus irrelevant. For these the project emissions are calculated as:

$$PE_{ww,treatment,y} = \sum_i (Q_{ww,k,y} * COD_{inflow,k,y} * \eta_{PJ,i} * MCF_{ww,treatment,PE,i}) * B_{o,ww} * UF_{BL} * GWP_{CH4}$$

Parameter	Description	Value	Unit
$PE_{ww,treatment,y}$	Project emissions of the wastewater treatment systems affected by the project activity	[Value]	tCO_2e/yr
$Q_{ww,k,y}$	Volume of wastewater treated in the project wastewater treatment system *k*	[Value]	t
$COD_{inflow,k,y}$	Chemical oxygen demand of the wastewater inflow to the baseline treatment system *k*	-	-
$\eta_{,PJ,k,}$	COD removal efficiency of the project treatment system *i*	[Value]	t/m^3
$MCF_{ww,treatment,PJ,i}$	Methane correction factor for project wastewater treatment systems *i*	[Value]	kg CH4/kg COD
$B_{0,ww}$	Methane producing capacity of the wastewater	0.25	
UF_{PJ}	Model correction factor to account for model uncertainties	0.89	-
GWP_{CH4}	Global warming potential of methane	21	tCO_2e/tCH_4

(xi) **Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$);**

The project activity affects systems of the baseline wastewater treatment plant as described above. This thus is thus irrelevant. For these the baseline emissions are calculated as:

$$PE_{s,treatment,y} = \sum S_{l,PJ,y} \cdot MCF_{s,treatment,l} \cdot DOC_s \cdot UF_{PJ} \cdot DOC_F \cdot F \cdot 16/12 \cdot GWP_{CH4}$$

Parameter	Descrip	Value	Unit
$PE_{s,treatment,y}$	Project emissions of the sludge treatment systems affected by the project activity	[Value]	tCO_2e

$S_{l,PJ,y}$	Amount of dry matter in the sludge treated by the sludge treatment system *l*	[Value]	t
$MCF_{s,treatment,l}$	Methane correction factor for sludge treatment	[Value]	t/m^3
DOC_s	Degradable organic content of the untreated sludge generated in the year *y* (fraction, dry	[0.5 or 0.257]	-
UF_{PJ}	Model correction factor	1.12	-
DOC_F	Fraction of DOC dissimulated to biogas	0.5	-
F	Fraction of CH4 in biogas	0.5	-
GWP_{CH4}	Global Warming Potential of methane	21	tCO_2e/tCH_4

(xii) **Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$);**

Project emissions on account of inefficiency of the project wastewater treatment system are only relevant for those systems that are affected by the project activity and that discharge treated wastewater. The calculation of emissions from this source is as follows:

$$PE_{ww,discharge,y} = Q_{ww,y} \cdot GWP_{CH4} \cdot B_{0,ww} \cdot UF_{PJ} \cdot COD_{ww,discharge,PJ,y} \cdot MCF_{ww,PJ,discharge}$$

[In case there is no system affected by the PA that discharges wastewater: The proposed activity does not affect a system of the wastewater plant that discharges wastewater to the project activity. This thus is thus irrelevant.

Parameter	Descri	Value	Unit
$PE_{ww,discharge,y}$	Project emissions from wastewater discharge	[Value]	tCO_2e
$Q_{ww,y}$	Volume of treated wastewater discharged	[Value]	m^3
GWP_{CH4}	Global Warming Potential of methane	21	tCO_2e/tCH_4
$Bo,_{WW}$	Methane producing capacity of the wastewater	0.25	kg CH4/kg COD
UF_{PJ}	Model correction factor	1.12	-
$COD_{ww,discharge,PJ,y}$	Chemical oxygen demand of the treated wastewater discharged into	[Value]	t/m^3
$MCF_{ww,PJ,discharge}$	Methane correction factor based on the discharge pathway	[Value]	-

(xiii) **Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$);**

[Keep if applicable, else delete: The project activity will generate final sludge. However, for the generated final sludge aerobic storage conditions will be ensured. This can be ensured by {Describe how aerobic conditions for decay of final sludge will be ensured}.]
[Keep if applicable, else delete: The project activity will generate final sludge. However, the quantities and the properties of final sludge are the same in the baseline and the project scenario. Therefore, this source is zero.]

[Delete if any of the above two statements was applicable: "Final sludge" is produced by the wastewater treatment plant. Project emissions from this source are calculated as follows:

$$PE_{s,final,y} = S_{final,PJ,y} \cdot DOC_s \cdot UF_{PJ} \cdot MCF_{s,PJ,final} \cdot DOC_F \cdot F \cdot 16/12 \cdot GWP_{CH4}$$

Parameter	Description	Value	Unit
$PE_{s,final,y}$	Project emissions from treatment of final sludge	[Value]	tCO_2e
$S_{final,PJ,y}$	Amount of dry matter in the final sludge	[Value]	t
DOC_s	Degradable organic content of the sludge generated (fraction, dry basis)	[0.5 or 0.257]	-
UF_{PJ}	Model correction factor	1.12	-
$MCF_{s,BL,final}$	Methane correction factor for disposal site of final sludge	[Value]	-
DOC_F	Fraction of DOC dissimulated to biogas	0.5	tCH_4/t DOC
F	Fraction of CH4 in biogas	0.5	-
GWP_{CH4}	Global Warming Potential of methane	21	tCO_2e/tCH_4

(xiv) **Methane fugitive emissions due to inefficiencies in capture systems ($PE_{fugitive,y}$);**

Project activity emissions from methane release in capture systems are determined as follows: This emission source is relevant to any project scenario as it applies to any installed biogas digester generating biogas. The calculation of this emission source is as follows:

$$PE_{fugitive,y} = 0.05 \cdot BG_{bumt,y}$$

For the ex-ante emission calculation the following formula will be applied:

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

Parameter	Description	Value	Unit
$PE_{fugitive,y}$	Fugitive emissions through capture inefficiencies	[Value]	tCO_2e
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems	[Value]	tCO_2e
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems	[Value]	tCO_2e

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

Parameter	Description	Value	Unit
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems	[Value]	tCO_2e
CFE_{ww}	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems	0.9	-
$MEP_{ww,treatment,y}$	Methane emission potential of wastewater treatment systems equipped with biogas recovery system	[Value]	t

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

Parameter	Description	Value	Unit
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems	[Value]	tCO_2e
CFE_{ww}	Capture efficiency of the biogas recovery equipment	0.9	-

	in the wastewater treatment systems		
$MEP_{ww,treatment,y}$	Methane emission potential of wastewater treatment systems equipped with biogas recovery system	[Value]	t
UF_{PJ}	Model correction factor	1.12	-
$MCF_{ww,treatment,PJ,k}$	Methane correction factor for the project wastewater treatment system *k* equipped with biogas recovery equipment	[Value]	-

In the baseline sludge treatment is not included, therefore:

$PE_{fugitive,s,y} = 0\ tCO_2e$

(xv) **Methane emissions due to incomplete flaring ($PE_{flaring,y}$);**

$PE_{flaring,y}$ Methane emissions due to incomplete flaring. The *ex post* emission reduction will be calculated as per "Tool to determine project emissions from flaring gases containing methane" by using actual monitored data.

Methane may be released as a result of incomplete combustion in the flare. To calculate project emissions from flaring of the biogas (PE_{flare}), the "Tool to determine project emissions from flaring gases containing methane" (version 01 approved at EB28) is applied.

For determination of the flare efficiency, a default value of 50/90% will be used for the calculation of project emissions from flaring gases if the CPA uses since an open/enclosed will be employed by the CPA.

The tool specifies 7 steps for calculation.

Step 1: Determination of the mass flow rate of the residual gas that is flared

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas.

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas. Alternatively, the tool provides a simplified approach to only measure the volumetric fraction of methane and to consider the deference to 100% as being nitrogen. The proposed project activity adopts this simplified approach.

Step 2 is not applicable because of the simplified approach taken where only the volumetric fraction of methane is measured.

Steps 3 & 4 are only applicable if the combustion efficiency of the flare is continuously monitored and are therefore not considered.

Step 5: Determination of methane mass flow rate in the residual gas on a dry basis

The quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions (normal conditions and dry or wet basis).

$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n}$ **Eq. 13 of Flaring Tool Version 01**

Where:

Parameter	Description	Value	Unit
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour *h*	[Value]	kg/h
$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour *h*	[Value]	m^3/h
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the residual gas on dry basis in hour *h*	[Value]	m^3/h
$\rho_{CH4,n}$	Density of methane at normal conditions	[Value]	kg/m^3

Step 6: Determination of the hourly flare efficiency

The CPA is using an open flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the flame is not detected for more than 20 minutes during the hour *h*.
- 50%, if the flare is detected for more than 20 minutes during the hour *h*.

The CPA uses an enclosed flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour *h* .
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h*, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour *h*.
- 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h* and the manufacturer's specifications on proper operation of the flare are met continuously during the hour *h*.

Step 7: Calculation of annual project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions from each hour *h*, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour *h* ($\rho_{flare,h}$), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1-\eta_{flare,h}) \times \frac{GWP_{CH4}}{1000}$$ **Eq. 15 of Flaring Tool Version 01**

Where:

Parameter	Description	Value	Unit

$PE_{flare,y}$	Project emissions from flaring of the residual gas stream in year *y*	[Value]	tCO_2e/yr
$TM_{RG,h}$	Mass flow rate of the methane in the residual gas in the hour *h*	[Value]	kg/h
$\eta_{flare,h}$	Flare efficiency in hour *h*	[Value]	fraction

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

Anaerobic storage of biomass due to the project activity is excluded by the formulated eligibility criteria. Thus:

$PE_{biomass,y}$ = 0 tCO_2e

Leakage (AMS-III.H)

If the technology is using equipment transferred from another facility, leakage effects at the site of the other activity are to be considered and estimated (LE_y).

Otherwise:

LE_y = 0 tCO_2e

B.7. Application of the monitoring methodology and description of the monitoring plan

B.7.1. Data and parameters to be monitored by each generic CPA

(Copy this table for each data and parameter)

Data / Parameter	$Q_{ww,i,y}$
Unit	m^3/month
Description	The flow of wastewater
Source of data	Onsite measurements
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measurements are undertaken using flow meters. Details e.g. location, configuration, accuracy, class of the measurement device are to be provided in the CPA-DD. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained)
QA/QC procedures	Flow meter will be calibrated prior to operation and a calibration certificate will be issued. Further calibration of the meter in accordance with relevant industry standard, local/national standards, or as per manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.
Purpose of data	Calculation of baseline emissions; Calculation of project emissions;
Additional comments	At the time of the CPA inclusion, for each of the relevant wastewater flow

	meter separate tables shall be provided. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$COD_{ww,untreated,y}$**
Unit	tCOD/m³
Description	The chemical oxygen demand of the wastewater before and after the treatment system affected by the project activity
Source of data	Representative Sampling by CPA implementer
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the COD according to national or international standards. COD is measured through representative sampling Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications. Cross-check will be performed at least every six months by accredited lab. In case accredited lab is used, the accreditation certificate will act as the proof of correct calibration and application of standard by the respective lab..
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$COD_{ww,treated,y}$**
Unit	tCOD/ m^3
Description	Chemical oxygen demand of the treated wastewater leaving the project treatment system
Source of data	Representative Sampling by CPA implementer
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the COD according to national or international standards. COD is measured through representative sampling Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications. Cross-check will be performed at least every six months by accredited lab. In case accredited lab is used, the accreditation certificate will act as the proof of correct calibration and application of standard by the respective lab.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$COD_{PJ,iuflow,k}$
Unit	tCOD/ m^3
Description	Chemical oxygen demand of the untreated wastewater entering the wastewater treatment systems affected by the project activity
Source of data	Representative Sampling by CPA Implementer
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the COD according to national or international standards. COD is measured through representative sampling. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications. Cross-check will be performed at least every six months by accredited lab. In case accredited lab is used, the acredition certificate will act as the proof of correct calibration and application of standard by the respective lab.
Purpose of data	Calculation of project emissions;
Additional comments	This may be applicable, for instance, where the baseline scenario is the use of open anaerobic lagoons and the project scenario is introduction of anaerobic digester prior to the existing open anaerobic ponds (i.e. without replacing the existing open anaerobic lagoons). The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$COD_{PJ,outflow,k}$
Unit	tCOD/ m^3
Description	Chemical oxygen demand of the treated wastewater leaving the wastewater treatment systems affected by the project activity and not equipped with biogas recovery in year y
Source of data	Representative Sampling by CPA Implementer
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the COD according to national or international standards. COD is measured through representative sampling. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications. Cross-check will be performed at least every six months by accredited lab. In case accredited lab is used, the accreditation certificate will act as the proof of correct calibration and application of standard by the respective lab..
Purpose of data	Calculation of project emissions;
Additional comments	This may be applicable, for instance, where the baseline scenario is the use of open anaerobic lagoons and the project scenario is introduction of anaerobic digester prior to the existing open anaerobic ponds (i.e. without replacing the existing open anaerobic lagoons). The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$COD_{ww,discharge,y}$**
Unit	tCOD/ m^3
Description	Chemical oxygen demand of the treated wastewater discharged to river/water/lake.
Source of data	Representative Sampling by CPA Implementer
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the COD according to relevant standards. COD is measured through representative sampling. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications. Cross-check will be performed at least every six months by accredited lab. In case accredited lab is used, the accreditation certificate will act as the proof of correct calibration and application of standard by the respective lab..
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$S_{final,PJ,y}$
Unit	t
Description	Amount of dry matter in final sludge
Source of data	Onsite measurements
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the total quantity of sludge on a wet basis. The volume (m^3) and density or direct weighing may 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 Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Monitoring of 100% of the sludge amount through continuous or batch measurements and moisture content through representative sampling to ensure the 90/10 confidence/precision level.
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications in case the weighbridge is available onsite. If a third party weight bridge is used, calibration certificate shall be requested from weight bridge owner.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$BG_{burnt,y}$**
Unit	m^3
Description	Annual volume of biogas combusted in year *y*
Source of data	Measured using continuous flow meters.
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	In all cases, the amount of biogas recovered, fuelled, flared or otherwise utilized shall be measured using continuous flow meters. If the biogas streams flared and fuelled (or utilized) are monitored separately, the two fractions can be added together to determine the total biogas recovered, without the need to monitor the recovered biogas before separation. The methane content measurement shall be carried out close to the biogas flow meters. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained)
QA/QC procedures	The measurement will be monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 will be attained). Meters will be calibrated as per vendor's specifications
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$\eta_{flare,h}$
Unit	%
Description	Flare efficiency in year *y* (fraction).
Source of data	Project Entity
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	As per the "Tool to determine project emissions from flaring gases containing Methane". Regular maintenance shall be carried out to ensure optimal operation of flares. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Continuously.
QA/QC procedures	As per the "Tool to determine project emissions from flaring gases containing methane". Maintenance and calibration as per manufacturer's specifications
Purpose of data	Calculation of project emissions;
Additional comments	In case the project uses an open flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is: • 0% if the flame is not detected for more than 20 minutes during the hour *h*. • 50%, if the flare is detected for more than 20 minutes during the hour *h*. In case the project uses an enclosed flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is: • 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour *h* . • 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h*, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour *h*. • 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h* and the manufacturer's specifications on proper operation of the flare are met continuously during the hour *h*. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$w_{CH4,y}$
Unit	%
Description	Methane content in biogas in year *y*
Source of data	Details e.g. location, configuration, accuracy, class of the measurement device are to be provided in the CPA-DD.
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	The fraction of methane in the gas will be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level. 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 shall be carried out close to a location in the system where a biogas flow measurement takes place. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	The fraction of methane in the gas should be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level.
QA/QC procedures	The measurement will be monitored regularly and the analyser used will be calibrated periodically as per vendor's specifications.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**T**
Unit	^{o}C
Description	Temperature of the biogas recovered
Source of data	Measurements from the temperature indicator
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	The temperature of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures	Calibration of the meter will be as per vendor's specifications.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**P**
Unit	Pa
Description	Pressure of the biogas
Source of data	Pressure measurement device
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	The pressure of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures	Calibration of the meter will be as per vendor's specifications.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$\mathbf{fv_{i,h}}$
Unit	-
Description	Volumetric fraction of component i in the residual gas in the hour h where i = CH4 , CO, CO2 , O2 ,H2 , N2
Source of data	Measurements by project participants using a continuous gas analyser
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	Ensure that the same basis (dry or wet) is considered for this measurement and the measurement of the volumetric flow rate of the residual gas (FV RG,h) when the residual gas temperature exceeds 60 ºC Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Continuously. Values to be averaged hourly or at a shorter time interval
QA/QC procedures	Analysers must be periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard certified gas.
Purpose of data	Calculation of project emissions;
Additional comments	As a simplified approach, project participants may only measure the methane content of the residual gas and consider the remaining part as N_2. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$FV_{RG,h}$**
Unit	m^3/h
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour h
Source of data	Measurements by project participants using a flow meter
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	Ensure that the same basis (dry or wet) is considered for this measurement and the measurement of volumetric fraction of all components in the residual gas ($fv_{i,h}$) when the residual gas temperature exceeds 60 ºC. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Continuously. Values to be averaged hourly or at a shorter time interval
QA/QC procedures	Flow meters are to be periodically calibrated according to the manufacturer's recommendation.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**T_{flare}**
Unit	°C
Description	Temperature in the exhaust gas of the flare
Source of data	Measurements by project participants
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. A temperature above 500 ºC indicates that a significant amount of gases are still being burnt and that the flare is operating. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Continuously.
QA/QC procedures	Thermocouples should be replaced or calibrated every year.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**Other flare operation parameters**
Unit	-
Description	This should include 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.
Source of data	Measurements by project participants
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	To be defined for each CPA at time of inclusion Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Continuously
QA/QC procedures	To be defined for each CPA at time of inclusion
Purpose of data	Calculation of project emissions;
Additional comments	Create copies of this table as required to indicate more parameters. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later.

	[REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$TDL_{j,y}$; $TDL_{k,y}$**
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to source *j/k* in year *y*
Source of data	As per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 01 (EB 39 annex 7).
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	As per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 01 (EB 39 annex 7). Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	----
QA/QC procedures	----
Purpose of data	Calculation of project emissions; Calculation of baseline emissions;
Additional comments	At the time of the CPA inclusion, for each of the relevant TDL separate tables shall be provided. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later.

Data / Parameter	$EC_{PJ,j,y}$
Unit	MWh/yr
Description	Quantity of electricity consumed by the project consumption source *j* in the year *y*
Source of data	Electricity meters or installed capacity multiplied by 8,760 h/yr multiplied by 1.1 to account for technical transmission and distribution losses.
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	If measured: Electricity meters continuously monitor power consumption by electrical equipment within the project boundary. If based on installed capacity: Calculated based on installed capacity in MW multiplied by 8,760 h/yr plus 10% Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	To be defined for each CPA at time of inclusion
QA/QC procedures	If measured: Regular maintenance of meters according to manufacturer's Indications and calibration according to national standards.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$FC_{DIESEL,i,y}$; $FC_{FO,i,y}$; $FC_{COAL,i,y}$**
Unit	Mass or volume unit per year (e.g. ton/yr or m3 /yr)
Description	Quantity of fossil fuel combusted in process j during year *y*
Source of data	On site measurement
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Description of the actual measurement method using any of the three alternatives provide in the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" shall be provided at individual CPA level. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	To be defined for each CPA at time of inclusion
QA/QC procedures	To be defined for each CPA at time of inclusion
Purpose of data	Calculation of project emissions;
Additional comments	At the time of the CPA inclusion, for each of the relevant fossil fuel separate tables shall be provided. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$NCV_{DIESEL,y}$; $NCV_{FO,y}$; $NCV_{COAL,y}$**
Unit	GJ / ton
Description	Weighted average net calorific value of the fossil fuel consumed in year *y*
Source of data	Any of the four data source in preferential order as mentioned in the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".
Value(s) applied	To be determined with respect to each CPA at time of inclusion
Measurement methods and procedures	Any of the four data source in preferential order as mentioned in the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". For option a) and b): Measurements should be undertaken in line with national or international fuel standards. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	To be defined for each CPA at time of inclusion
QA/QC procedures	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Purpose of data	Calculation of project emissions;
Additional comments	At the time of the CPA inclusion, for each of the relevant fossil fuel separate tables shall be provided. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$EF_{CO2,DIESEL,y}$; $EF_{CO2,FO,y}$; $EF_{CO2,COAL,y}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type *diesel; Fuel Oil; Coal* in year y
Source of data	Any of the four data source in preferential order as mentioned in the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".
Value(s) applied	Value to be determined by each CPA at time of inclusion.
Measurement methods and procedures	Any of the four data source in preferential order as mentioned in the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". For option a) and b): Measurements should be undertaken in line with national or international fuel standards. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	To be defined for each CPA at time of inclusion
QA/QC procedures	To be defined for each CPA at time of inclusion
Purpose of data	Calculation of project emissions;
Additional comments	At the time of the CPA inclusion, for each of the relevant fossil fuel separate tables shall be provided. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	End use of sludge
Unit	n.a.
Description	Sludge from anaerobic digesters in project scenario
Source of data	Sludge is directly applied to land or used as input for the onsite aerobic composting plant.
Value(s) applied	There are no project emissions to be taken into account, as in line with AMS.III.H.
Measurement methods and procedures	Any other usage of the sludge other than land application or composting will be monitored. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	To be defined for each CPA at time of inclusion
QA/QC procedures	N.a.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

B.7.2. Description of the monitoring plan for a generic CPA

>>

In order to ensure all CPAs are monitored and verified as per the applied monitoring methodology, the CME has prepared a comprehensive monitoring plan for all the CPAs to be included in the PoA. Furthermore, the CME will conduct periodical inspection of units randomly at any given time in a year. For this purpose the CME will deploy trained monitoring personnel who will visit the CPAs sites, review their records and take corrective actions if required. The monitoring personnel would duly attest the records as a mark of satisfactory inspection. The CME would randomly check the visits of monitoring personnel in order to ensure due compliance of registered monitoring plan.

Templates (as a part of monitoring manual) are made to record the data to be monitored. The monitoring personnel of the CME would be provided with such templates. In-house training shall be imparted to plant personnel (at the CPA site) for the efficient monitoring/recording of the data and to translate the same into the computation of emission reductions.

The key considerations for developing monitoring plans in individual CPAs are discussed below.

1. Introduction

The Monitoring Plan (MP) would present a plan to meet the requirements for the collection, processing and reporting of data. It will describe the management systems and procedures to be implemented by CME upon implementation of each CPA in order to ensure consistency between the project operation as well as monitoring, processing and reporting of data required for the calculation of emission reductions (ERs).

2. Obligations of CME

It will be the responsibility of the CME to develop and implement a management and operational system for a CPA that will meet the requirements of the MP.

3. Description of data required to be monitored

Data for each parameter will be monitored at a frequency described in the relevant table of section D.7.1. The main equipments used for monitoring are:

- Wastewater flow meters
- Steam flow meters
- Biogas flow meters
- Biogas Pressure gauge
- Biogas Temperature sensor
- Gas analyzer for measuring the methane content in biogas
- Flame detector Temperature sensor for flame monitoring
- Electricity meters
- COD laboratory test results.

The MP will identify the various data parameters to be monitored in order to calculate the emission reductions. Data parameters which need to be monitored will be recorded in the following format:

Parameter ID	Name of the Data Parameter	Data unit of the parameter
[ID]	[Parameter information]	[Unit]

Table B.7.1.1 – description of data required for monitoring

4. Recommendations for improvisation in the monitoring plan

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

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

This section will contain a detailed description of the data collection and recording measures to be implemented for each of the data parameter which is monitored under the CPA. This section will address the following criteria for each of the monitoring data parameter:

1. Description of the primary source of data from where the information pertaining to the data parameter will be collected
2. Description of the data collection process
3. Description of the data recording process
4. Description of the measurement instruments, in case a given parameter is to be measured (for e.g. meters used for measuring energy consumption, operating hours)
5. Calibration requirement of the measurement instrument

6. Description of data storage process
7. Other information, if required

The other relevant data will be recorded by the CPA owners and would be provided on quarterly basis to the CME. The data received will be archived electronically for computations of emission reductions on annual basis. Such archived data will be kept until two years after the end of the crediting period or the issuance of CERs whichever is later. Each small scale CPA shall follow all the provision of the PoA including that related to monitoring. Only those CPA implementers who confirm to sign an agreement in this context shall be included in the PoA, as this is a part of eligibility criteria

6. Independent monitoring of scrapping of replaced equipment:

In case project activity involves replacement of equipment, and leakage effect of the use of replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified

7. Procedures for emergency preparedness for cases where emergencies cause unintended emissions:

For each CPA an emergency preparedness procedure will be developed which takes into account:

- Procedures to avoid unintended emissions during operation and maintenance
- General procedures to avoid unintended emissions due to activities near the biogas plan.
- Inspection procedures to ensure integrity of the biogas plant

8. Procedures for review of the reported results/data:

To minimize the possible errors in the process of data collection, the entry of data gathered during onsite visits by the monitoring personnel of the CME will be compared with the data submitted by CPA implementers throughout the year. The data will be reviewed by the CME and a comparison between the data sent by the CPA implementers and the data obtained during the onsite visit by the monitoring personnel shall be performed to ensure that the data are consistent and correct.

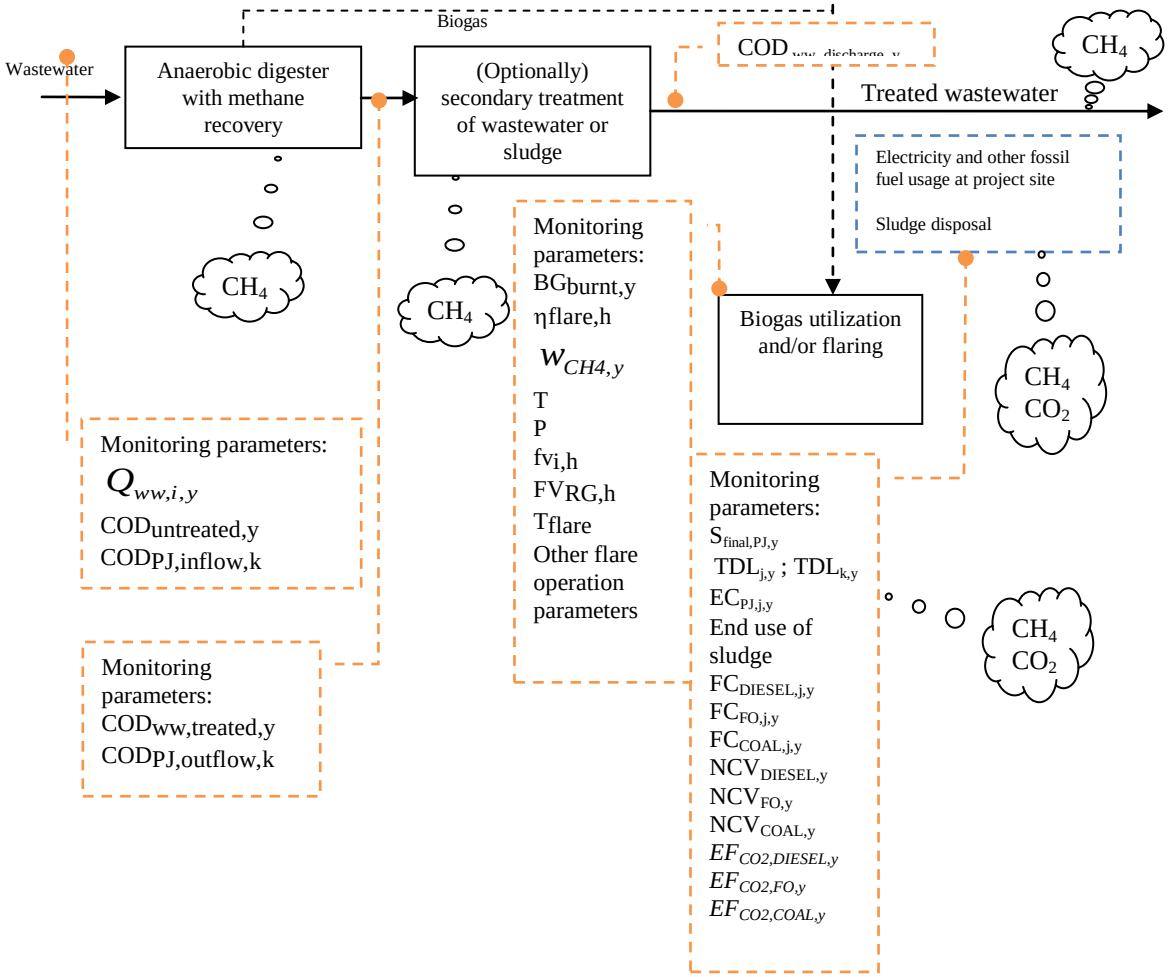


Figure B.7.2.1. Flowchart of Monitoring program and monitoring locations at the project

Reporting, archiving and preparation for periodic verification

The CPA Implementer will in principle report the monitoring data annually but may deviate to report at intervals corresponding to agreed verification periods and will ensure that these intervals are in accordance with CDM requirements. The CPA Implementer will ensure that all required documentation is made available to the verifier. Data record will be archived for a period of 2 years after the crediting period to which the records pertain.

Quality Assurance

The following quality assurance measures will be taken relating to the monitoring equipment and its installation and operation and data storage:

- All meters, sensing and sampling equipment have to be designed and manufactured to International standards.
- The central PLC used for managing the data requirements of the biogas plant will be located in a secure, sealed housing to prevent damage or tampering.
- Routine maintenance and calibration of all monitoring equipment will be performed in accordance with the manufacturer's specification to ensure that the data remains accurate.
- A paper backup of the monthly electronic data file will be stored in a secure location onsite.

To ensure the quality of the recorded data, all personnel will be trained in accordance with this monitoring plan.

PROCEDURES IN CASE OF DAMAGED METERING EQUIPMENT / EMERGENCIES

Damages to metering equipment:

Lost data due to equipment failure will be reconstructed from former and subsequent series measurements up to 6 months after the equipment failed. This is considered reasonable as despite a quality control, maintenance and auditing system in place, instrument failure and delays in replacement may still occur. During this period, additional evidence will be used to demonstrate the continuing of factory operations to avoid suspicion that the data is indeed missing due to instrument failure and not cessation of the production process.

In case of any unforeseen event that is not covered under this monitoring plan, the CPA implementer should be informed immediately. The problem should be remedied as soon as possible. Monitoring group should take measures to ensure avoid similar problem.

The CPA implementer will be responsible for managing the collection, and storing and archiving of all data and records. All relevant data will be archived electronically and backed up regularly.

Emergencies:

In case of emergencies, the project entity will not claim emission reductions due to the project activity for the duration of the emergency. The project entity will follow the below procedure for declaring the emergency period to be over:

1. The project entity will ensure that all requirements for monitoring of emission reductions have been re-established.
2. The monitoring officer and the head of operations of the power station will both sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

OPERATIONAL AND MANAGEMENT STRUCTURE FOR MONITORING

The monitoring of the emission reductions will be carried out according to the scheme shown in Figure B.7.2.2. The project entity will engage its CDM advisor, Blue World Carbon to assure that all monitoring requirements are met. Within the CPA Implementer a monitoring officer is appointed who will carry the day-to-day supervision responsibility. The first step is the measurement of the electrical energy supplied to the grid and reporting of daily operations, which will be carried out by the plant operation staff.

The monitoring officer who will be responsible for verification of the measurement, collection of sales receipts, collection of billing receipts of the power supplied by the grid to the power plant and the calculation of the emissions reductions. The monitoring officer will prepare operational reports of the project activity, recording the daily operation of the power station including operating periods, power delivered to the grid, equipment defects, etc. The selection procedure, tasks and responsibilities of the monitoring officer are described in detail in Annex 4. Finally, the monitoring reports will be reviewed by Blue World Carbon.

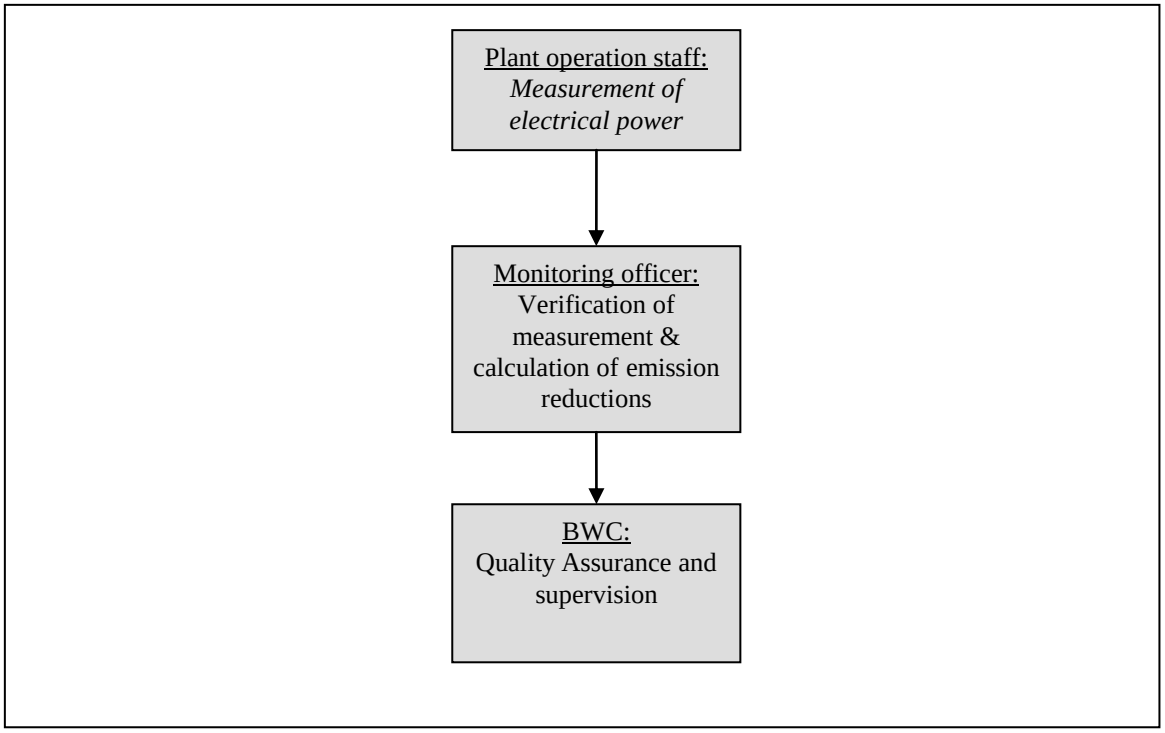


Figure B.7.2.2 **Management structure in order to monitor emission reductions**

- - - - -

SECTION C. General description of a generic CPA

****

NOTE: THIS GENERIC CPA-DD BELOW EXPLAINS CPA THAT APPLY ONLY METHODOLOGY AMS.III.H ONLY. REFER TO GENERIC CPA-DD ABOVE THAT APPLIES A COMBINATION OF AMS.III.H AND AMS.I.D.

****

C.1. Purpose and general description of generic CPAs

>>

The purpose of a typical CDM Programme Activity (CPA) is recovering biogas from organic matter in wastewater treatment plants within the host country, combined with flaring and/or gas utilization. A CPA is constituted by one project activity. The measure(s) may include one or more individual project sites and lead to an annual emission reduction not exceeding 60 kt CO_2 equivalents annually. The measures may be implemented at Greenfield or new facilities by one or more CPA implementers. CPA that utilizes biogas for the production of power can optionally select scenario E to be able to claim the respective emission reduction due to exported of electricity to the grid. The capacity of the power generation equipment shall not exceed a combined installed capacity of 15 MW.

The following scenarios are eligible for inclusion under the PoA:

Table II.A.2.1 - Description of a typical small-scale CDM programme activity

Project Scenario	Description of scenario

1	Biogas plants installed at new (Greenfield) facilities
2	Biogas plants installed at existing facilities
E	Utilization of biogas for power generation (in combination with scenario 1 or 2)

The Project activity is a small-scale PoA Program activity and conforms with Appendix B of the simplified modalities and procedures for small-scale CDM Project activities. A monitoring plan and data recording and archiving system will be implemented, where BWC will keep all records for the production of the monitoring reports.

SECTION D. Application of a baseline and monitoring methodology

D.1. Reference of the approved baseline and monitoring methodology(ies) selected

>>

The approved baseline and monitoring methodology applied to a CPA included in this PoA is:

- AMS-III.H "Methane Recovery in Wastewater Treatment" Version 16, EB 58, Sectoral Scope 13 (Waste handling and disposal)
- AMS.I.D: "Grid connected renewable electricity generation"; Version 17, EB 61, Sectoral Scope 01 (energy industries).

Selected methodologies are approved for application to CPAs under PoAs by the Board.

Reference to the approved baseline and monitoring methodologies:
http://cdm.unfccc.int/methodologies/SSCmethodologies/approved

The approved Methodological Tools applied to a CPA included in this PoA are:

- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, Version 02 (EB 41 annex 11).
- "Tool to calculate the emission factor for an electricity system", Version 2.2.1 (EB 63 annex 19)
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 01 (EB 39 annex 7).
- "Tool to determine project emissions from flaring gases containing methane", Version 01 (EB 28 annex 13).

Reference to the applied Methodological Tools:

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/

D.2. Application of methodology(ies)

>>

The project activities in this PoA comply with the applicability conditions as stipulated in AMS.III.H Version 16 as indicated in the table below.

Table II.B.2.1: Applicability conditions of methodology AMS.III.H Version 16[28]

Applicability Conditions	CPA Status	Documentation required
15. This methodology comprises measures that recover biogas from biogenic organic matter	Each proposed CPA under this PoA will be in relation to recovery of methane (i.e.	☐ Feasibility Study or Technical

[28] The number in front of each paragraph indicates the respective paragraph of AMS.III.H Version 16.

in wastewater by means of one, or a combination, of the following options: (g) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; (h) Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; (i) Introduction of biogas recovery and combustion to a sludge treatment system; (j) 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;[29] (k) Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream; (l) Introduction of a sequential stage of wastewater treatment with biogas recovery 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).	biogas) from anaerobic treatment of industrial wastewater in an anaerobic digester system, which would have otherwise been emitted into the atmosphere. The measure to be introduced in each CPA includes option 1(a), 1(d) or 1(f), as identified in paragraph 1 of AMS-III.H version 16.	Proposal of the project
16. In cases where baseline system is anaerobic lagoon the methodology is applicable if: (d) The lagoons are ponds with a depth greater than two meters, without aeration. The value for depth is obtained from engineering design documents, or through direct measurement, or by dividing the	In cases where the baseline system is anaerobic lagoons, the CME will ensure that the lagoons are in compliance with conditions (a) and (c) The CME will obtain the value for depth from engineering design documents, or	To confirm §2(a): ☐ Feasibility Study or Technical Proposal of the project ☐ Engineering design of the open lagoon (if

[29] Other technologies in Table 6.3 of Chapter 6: Wastewater Treatment and Discharge of 2006 IPCC Guidelines for National Greenhouse Gas Inventories are included.

surface area by the total volume. If the lagoon filling level varies seasonally, the average of the highest and lowest levels may be taken; (e) Ambient temperature above 15°C, at least during part of the year, on a monthly average basis; (f) The minimum interval between two consecutive sludge removal events shall be 30 days.	through direct measurement, or by dividing the surface area by the total volume and sludge removal events from the operations logbook and confirmation from the CPA implementer. The average ambient temperature in Indonesia is 27.7[30] degrees Celsius, which is higher than 15 degrees as stated in paragraph (b).	available) ☐ Report on direct measurement of depth of lagoon or by dividing the surface area by the total volume (if engineering design not available). To confirm §2(b) ☐ Document on weather statistics from public source for the last 03 years. To confirm §2(c) ☐ sludge removal events from the operations logbook and confirmation from the CPA implementer.
17. The recovered biogas from the above measures may also be utilised for the following applications instead of combustion/flaring: (f) Thermal or mechanical,[31] electrical energy generation directly; (g) Thermal or mechanical, electrical energy generation after bottling of upgraded biogas, in this case additional guidance provided in Annex 1 shall be followed; or (h) Thermal or mechanical, electrical energy generation after upgrading and distribution, in this case additional guidance provided in Annex 1 shall be followed:	The recovered biogas from the above measures may also be utilised for application (a) of the applications listed in paragraph 3. This will be determined by reviewing the technical design documentation of the project at time of inclusion (as per eligibility criteria of the project). CPA where biogas is utilized for applications as listed in paragraph 3 (b) to	☐ Feasibility Study or Technical Proposal of the project

[30] http://www.climatetemp.info/indonesia/

[31] For example combusted in a prime mover such as an engine coupled to a machine such as grinding machine.

(iv) Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; (v) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or (vi) Upgrading and transportation of biogas (e.g. by trucks) to distribution points for end users. (i) Hydrogen production; (j) Use as fuel in transportation applications after upgrading.	(e) are not eligible for inclusion under this PoA.	
18. 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.	Emission reductions will be considered from the use of recovered methane under methodology AMS.I.D where applicable.	☐ Emission reduction calculation worksheet prepared for the CPA as per methodology requirements.
19. For project activities covered under paragraph 3 (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".	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
20. For project activities covered under paragraph 3 (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	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	

grid is within the host country boundaries.		
21. For project activities covered under paragraph 3 (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.	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
22. In particular, for the case of 3 (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 11 of Annex 1 of AMS-III.H "Methane recovery in wastewater treatment" shall be followed in this regard.	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
23. For project activities covered under paragraph 3 (b) and (c), this methodology is applicable if the upgraded methane content of the biogas is in accordance with relevant national regulations (where these exist) or, in the absence of national regulations, a minimum of 96% (by volume).	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
24. If the recovered biogas 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. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
25. If the recovered biogas is used for project activities covered under paragraph 3 (e), that component of the project activity shall use corresponding methodology AMS-III.AQ "Introduction of Bio-CNG in road transportation".	Not applicable. CPA where biogas is utilized for applications as listed in paragraph 3 (b) to (e) are not eligible for inclusion under this PoA.	
26. 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.	In case of CPA that are Greenfield projects, the baseline scenario shall be determined in accordance with latest version of the General Guidance on General Guidelines to SSC CDM methodologies.	☐ Description in the specific CPA-DD on the consideration of requirements of the General Guidance on General Guidelines to SSC CDM methodologies.
27. The location of the wastewater treatment	The location of the wastewater treatment plant	☐ Description in the specific CPA-

plant as well as the source generating the wastewater shall be uniquely defined and described in the PDD.	as well as the source generating the wastewater will be uniquely defined and described in the specific CPA-DD.	DD of the location of the wastewater treatment plant as well as the source generating the wastewater in section A.5 and location in section A.7 of the CPA-DD.
28. Measures are limited to those that result in aggregate emissions reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity.	CPAs to be included in the PoA shall be limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.	☐ Emission reduction calculation worksheet prepared for the CPA as per methodology requirements. ☐ Description in the specific CPA-DD that the CPA result in aggregate emissions reductions of less than or equal to 60 kt CO_2 equivalent annually
38. The following conditions apply for use of this methodology in a project activity under a programme of activities: In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.	In case the project activity involves the replacement of equipment this paragraph will be taken into consideration.	☐ Scrapping documentation (in case equipment was replaced).

Projects that have selected scenario E (utilization of biogas as fuel for power generation and export to the grid) shall also comply with the applicability conditions of AMS.I.D Version 17. Demonstration of the applicability or a typical CPA is described below:

Table II.B.2.2: Applicability conditions of methodology AMS.I.D[32]

Applicability Conditions	CPA Status	
§1: This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass:[33] (a) Supplying electricity to a national or a regional grid; or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	A CPA will consist of a renewable energy generation unit that: a) supplies electricity to a national or regional Indonesian grid; or b) supplies electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	Any of the following documents: ☐ (Pre) Power Purchase Agreement, ☐ Letter from grid operator on acceptance of purchase of electricity from CPA. ☐ Feasibility Study / ☐ Technical Proposal of the project
§2: Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A[34]) applies is included in Table 2.	All CPA will conform to AMS.I.D: (a) Supplying electricity to a national or a regional grid; or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	Any of the following documents: ☐ (Pre) Power Purchase Agreement, ☐ Letter from grid operator on acceptance of purchase of electricity from CPA. ☐ Feasibility Study / ☐ Technical Proposal of the project
§3: This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition;[35]	CPA under this PoA may involve: (a) Installation of a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition;[36]	Any of the following documents: ☐ Feasibility Study or technical Proposal of the project

[32] The number in front of each paragraph indicates the respective paragraph of AMS.I.D Version 17.

[33] Refer to EB 23, annex 18 or the definition of renewable biomass.

[34] AMS-I.D "Grid connected renewable electricity generation", AMS-I.F "Renewable electricity generation for captive use and mini-grid" and AMS-I.A "Electricity generation by the user"

[35] A capacity addition is an increase in the installed power generation capacity of an existing power plant through: (i) The installation of a new power plant besides the existing power plant/units; or (ii) The installation of new power units, additional to the existing power plant/units. The existing power plant/units continue to operate after the implementation of the project activity.

[36] A capacity addition is an increase in the installed power generation capacity of an existing power plant through: (i) The installation of a new power plant besides the existing power plant/units; or (ii) The installation of new

§4: Hydro power plants with reservoirs[37] that satisfy at least one of the following conditions are eligible to apply this methodology: A. The project activity is implemented in an existing reservoir with no change in the volume of reservoir; B. The project activity is implemented in an existing reservoir,[38] where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2; C. The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	This is not applicable since the CPA do not involve establishment of hydropower plants.	
§5: If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	CPAs will consider this condition and the installed capacity of the renewable component shall not exceed 15 MW as per eligibility criteria.	Any of the following documents: ☐ Feasibility Study or technical Proposal of the project
§6: Combined heat and power (co-generation) systems are not eligible under this category.	CPAs that apply technology scenario E will consider this condition and thus not include combined heat and power systems.	
§7: In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added	CPAs will consider this condition and the installed capacity of the renewable component shall not exceed	Any of the following documents: ☐ Feasibility Study or technical Proposal

power units, additional to the existing power plant/units. The existing power plant/units continue to operate after the implementation of the project activity.

[37] A reservoir is a water body created in valleys to store water generally made by the construction of a dam.

[38] A reservoir is to be considered as an "existing reservoir" if it has been in operation for at least three years before the implementation of the project activity.

capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	15 MW as per eligibility criteria.	of the project
§8: In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	CPAs will consider this condition and the installed capacity of the renewable component shall not exceed 15 MW as per eligibility criteria.	Any of the following documents: ☐ Feasibility Study or technical Proposal of the project
§25: In the specific case of biomass project activities the applicability of the methodology is limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.	Not applicable, as the CPA are not biomass project activities.	
§26: In the specific case of biomass project activities the determination of leakage shall be done following the general guidance for leakage in small-scale biomass project activities (attachment C of Appendix B [39] of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.	Not applicable, as the CPA are not biomass project activities.	
§27: In case the project activity involves the replacement of equipment, and the leakage from the use of the replaced equipment in another activity is neglected because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.	CPAs will consider this condition as per eligibility criteria.	☐ Scrapping documentation (in case equipment was replaced).

Table II.B.2.3: Justification that CPA qualifies as Type I, II, and/or III

[39] Available on <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>.

Applicability Conditions	CPA Status
The CPA qualifies as Type I, II, and/or III during every year of the creating period in accordance with applicable provisions for project activity eligibility in the project standard.	As per Clean development mechanism project standard (version 01.0), renewable energy project activities with a maximum output capacity of 15 MW (or an appropriate equivalent) qualifies as Type I. For CPA under this PoA the renewable energy output capacity will be determined based the guidance in the latest version if the General Guidelines to SSC CDM methodologies at time of inclusion. Project activities which result in GHG emission reductions not exceeding 60 ktCO_2e per year in any year of the crediting period can qualify as Type III. Prior to inclusion of the CPA, CME will prepare a emission reduction spread sheet calculated in line with the methodology requirements and taking into consideration future developments of the CPA implementer (capacity increase, etc). The CPA implementer and CME will confirm in the CPA-DD that the CPA will result in emission reduction of less than or equal to 60 kt CO_2 annually during the whole crediting period.

D.3. Sources and GHGs

>>

For CPA that comply with project scenario 1 or 2 the following emission sources and gases shall be included in the CPA boundary:

Table II.B.3.1 Emission sources and gases included in the CPA boundary

	Source	Gas	Included	Justification
Baseline Scenario	Decay emissions from the baseline wastewater treatment system	CO_2	No	Excluded for simplification.
		CH_4	Yes	Major emission source in case of wastewater treatment plants.
		N_2O	No	Excluded for simplification.
	Decay emissions from the baseline sludge treatment system	CO_2	No	Excluded for simplification.
		CH_4	No	Major emission source in case of sludge treatment plants.
		N_2O	No	Excluded for simplification.
	Emissions on account of electricity or fossil fuel used	CO_2	Yes	May be an important source of emission if the baseline involves the use of electricity or fossil fuels.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.

	Emissions from the discharge of the effluent into river/lake/sea	CO_2	No	Excluded for simplification.
		CH_4	Yes	Major emission source in case of wastewater being discharged to sea/river/lake.
		N_2O	No	Excluded for simplification.
	Emissions from anaerobic decay of final sludge	CO_2	No	Excluded for simplification.
		CH_4	No	Emission source in case of final sludge being disposed of anaerobically in the baseline.
		N_2O	No	Excluded for simplification.
Project Scenario	Emissions from electricity or fuel consumption in the project activity	CO_2	Yes	May be a source of emissions.
		CH_4	No	Minor source. Excluded for simplification.
		N_2O	No	Minor source. Excluded for simplification.
	Emissions from wastewater treatment system affected by the project activity and not equipped with biogas recovery	CO_2	No	Minor source. Excluded for simplification.
		CH_4	Yes	Important emission source in case of wastewater treatment plants.
		N_2O	No	Minor source. Excluded for simplification.
	Emissions from sludge treatment system affected by the project activity and not equipped with biogas recovery	CO_2	No	Minor source. Excluded for simplification.
		CH_4	No	Important emission source in case of sludge treatment plants.
		N_2O	No	Minor source. Excluded for simplification.
	Emissions from the discharge of the effluent into river/lake/sea	CO_2	No	Minor source. Excluded for simplification
		CH_4	Yes	Important emission source in case of wastewater discharge to sea/river/lake.
		N_2O	No	Minor source. Excluded for simplification.
	Emissions from biogas release in capture system	CO_2	No	Minor source. Excluded for simplification.
		CH_4	Yes	Inefficiency in methane capture in the anaerobic digesters may contribute to methane emissions from biogas systems.
		N_2O	No	Minor source. Excluded for simplification.
	Emissions due to incomplete flaring of biogas	CO_2	No	It is assumed that CO_2 emissions from recovered biogas do not lead to changes of carbon pools.
		CH_4	Yes	May be an important source of emission. Incomplete combustion of biogas due to efficiency of flaring system leads to fugitive emission of methane.
		N_2O	No	Not applicable
	Emissions from anaerobic decay of the final sludge	CO_2	No	Excluded for simplification.
		CH_4	No	Might represent an emission source.
		N_2O	No	Excluded for simplification.
	Emissions from biomass stored under anaerobic conditions	CO_2	No	Excluded for simplification.
		CH_4	No	Might represent an emission source.
		N_2O	No	Excluded for simplification.

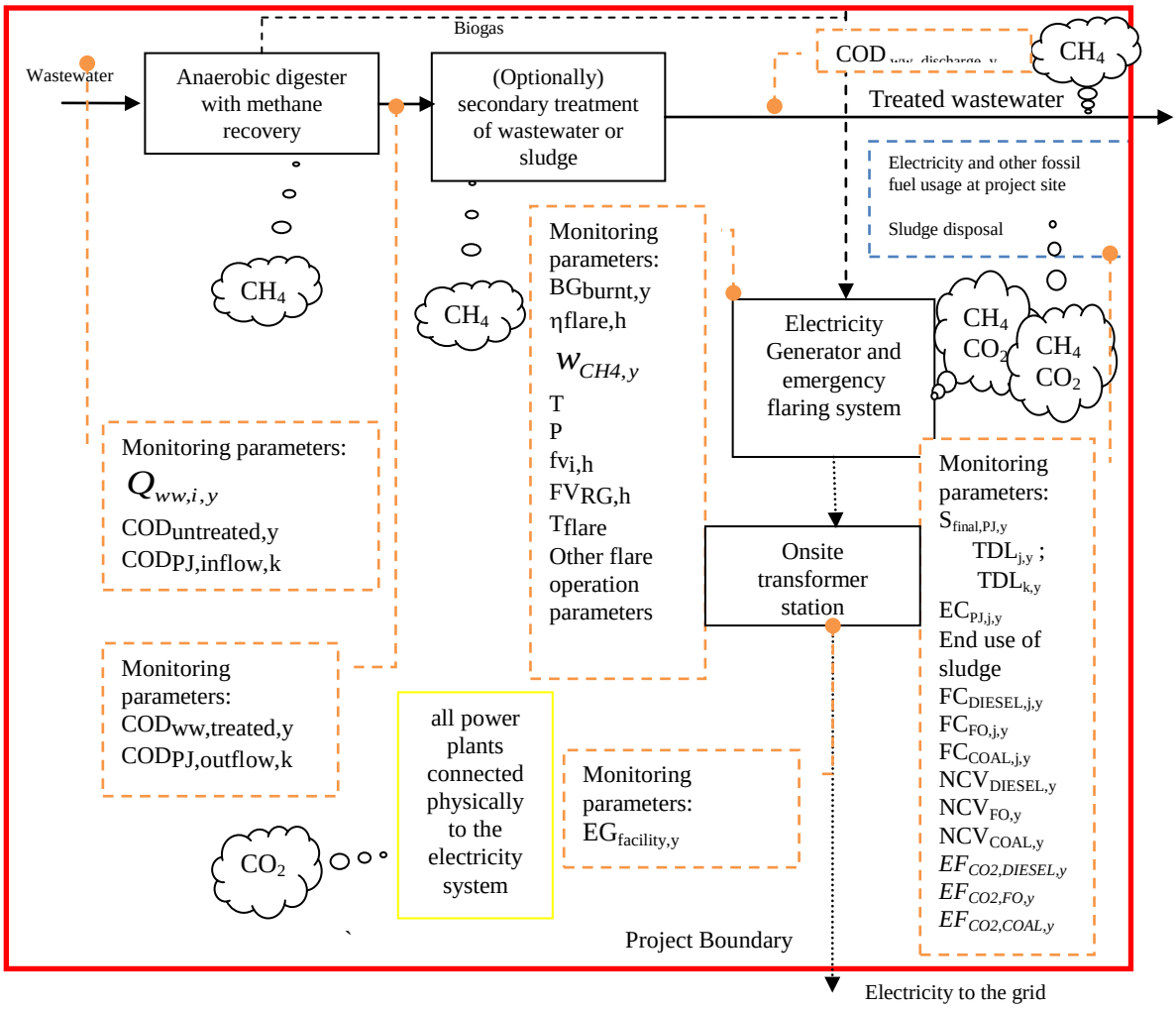
For CPA that have selected technology scenario E, the following emission sources and gases shall also be included:

According to "Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories, AMS-I.D., Version 17, EB 61, 3 June 2011, the spatial extent of the CPA its project boundary includes the physical and geographical site of the renewable generation source that includes the biogas power plant as well as the sub-station connection to the relevant electricity grid (a regional grid system). Figure B.3.1 shows the project flowchart and its boundaries.

Table II.B.3.2 Emission sources and gases included in the CPA boundary for scenario E

Source		Gas	Included?	Justification / Explanation
Baseline	CO_2 emission from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Included	Main emission source
		CH_4	Excluded	Minor emission source.
		N_2O	Excluded	Minor emission source.
CPA Projgrame activity	Electricity consumption / generation	CO_2	Included	May be an important emission source. If electricity from grid and/or electricity from captive diesel power plant is consumed to run the project activity, emissions from these sources shall be included.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

Figure II.B.3.1 Flow diagram of the project boundary for technological scenario 1 and two in combination with scenario E



Flow diagram Figure II.B.3.1 is generic in nature but each CPA-DD is required to delineate the project boundary in a flow diagram in accordace with the completing guideline of the CPA-DD.

D.4. Description of baseline scenario

>>

As per AMS-III.H version 16, in case of existing industrial wastewater treatment facilities, the baseline will be the continuation of the existing system for wastewater treatment. This is evident in the paragraph 26 and 27 of the methodology where the past historic records or baseline measurement campaign undertaken before project implementation is required for estimating emissions associated with the prevailing baseline.

However, in case of Greenfield industrial wastewater treatment facilities and activities involving change of equipment resulting in capacity addition of the wastewater and/or sludge treatment system compared to the design capacity of the baseline system, the CPA is only eligible to use the baseline and monitoring methodology if they are able to demonstrate using the latest version of the "General Guidelines to SSC CDM Methodologies" at time of inclusion, that the most plausible baseline scenario for the project activity is the baseline provided in the baseline and monitoring methodology. The baseline determined using the "General Guidelines to SSC CDM Methodologies" will be one of the following:

- Aerobic wastewater treatment system without biogas recovery

- Anaerobic wastewater treatment system (such as lagoon, septic tank or an on-site industrial plant[40]) without biogas recovery

CPA that are greenfield facilities shall perform a baseline assessment test to determine the appropriate baseline. The baseline assessment shall be documented in annex 3 of the CPA-DD.

For CPA that also apply technology scenario E the baseline shall be also defined as follows:
In accordance with AMS-I.D version 17, paragraph 10, the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

D.5. Demonstration of eligibility for a generic CPA
>>

Table II.B.5.1 – Eligibility criteria for a CPA to enrol in the PoA

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
A.	The CPA shall be located within the geographical territory of Indonesia.	One of the following documents shall be provided: ☐ Declaration from the CPA implementer confirm that the boundary of the implemented CPA is within the geographical territory of Indonesia and including information regarding geographic reference (latitude and longitude), name and address of the CPA. ☐ Business license of the CPA implementer issued by Indonesian local authorities.	☐ Yes ☐ No
B.	The CPA implementer has signed a valid contractual agreement with the CME which permits its participation and inclusion in the PoA. Furthermore, the CPA implementer has signed an undertaking/declaration to declare that it is aware of the duties and responsibilities of a CPA implementer and the acceptance of the terms and conditions of the PoA. This contract and declaration are one of the measures to avoid double counting as it would contain the name and full details	The following document shall be provided: ☐ Contractual agreement between CME and CPA implementer. ☐ Declaration from the CPA Implementer to declare that it is aware of the duties and responsibilities of a CPA implementer and the acceptance of the terms and conditions of the PoA.	☐ Yes ☐ No

[40] Other technologies in table 6.3 of chapter 6: Wastewater Treatment and Discharge of 2006 IPCC guidelines for National Greenhouse Gas Inventories are included.

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
	of CPA implementer at the same time, the agreement/undertaking by the CPA implementer is stating that the CPA is only a part of this PoA and shall not be subscribed as a stand-alone project or part of any other PoA.		
C.	The CPA must demonstrate that the participation of the CPA is voluntary and there is no requirement or enforcement under existing national/state/local regulations to introduce anaerobic digester equipped with methane recovery system.	The following document shall be provided: ☐ Declaration from the CPA Implementer regarding voluntary implementation of the wastewater treatment technology and confirmation that there is no requirement or enforcement under existing national/state/local regulations to introduce anaerobic digester equipped with methane recovery system. And: ☐ Confirmation in the CPA-DD regarding voluntary implementation by CPA implementer of the wastewater treatment technology and confirmation that there is no requirement or enforcement under existing national/state/local regulations to introduce anaerobic digester equipped with methane recovery system.	☐ Yes ☐ No
D.	The CPA shall confirm to one of project scenarios as described in section A.2 of the PoA-DD	The following document shall be provided: ☐ Confirmation by the CME regarding the applicable project scenario for the CPA. Any of the following documents shall be provided: ☐ Purchase order of equipment ☐ Feasibility Study / Technical Proposal of the project that describes the project technology.	☐ Yes ☐ No
E.	The start date of the CPA shall not	One of the following documents	

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
	be before the commencement of validation of the PoA as a whole (date the PoA was published for global stakeholders comment)	shall be provided: ☐ In case available, the earliest signed equipment or (sub) contractor agreement with a total contract value that is significant to the project activity (the date of signing the purchase order by CPA Implementer shall constitute the starting date of the CPA). ☐ Declaration of from the CPA Implementer that no contracts have been signed with a total contract value that is significant to the project activity	☐ Yes ☐ No
F.	The CPA shall meet the applicability and other requirements of the methodology AMS.III.H Version 16.	As described in section E.2 of the PoA-DD the CPA shall meet all relevant requirements of the methodology and the required evidence documentation shall be provided to the DOE at the time of inclusion.	☐ Yes ☐ No
G.	Demonstration of additionality as described in section B.5 of the PoA-DD in line with paragraph 7 and 9 of annex 05, EB 70. Additionality for the CPAs is demonstrated by applying one of the two options as following: **<u>Approach 1:</u>** In case the CPAs falling into Microscale projects (up to 5 MW): Documentation to support the conditions satisfied based on "Guidelines for demonstrating additionality of microscale project activity", version 04, Annex 26 of EB 68; **<u>Approach 2:</u>** For CPAs as small scale project activities: evidences that at least one of the barriers described in the section B.5 (according to the "Guidelines on the demonstration of additionality of small-scale project activities", Version 09.0 annex 27, EB 68 or the latest	Any of the following documents at CPA level shall be provided: ☐ In case the CPAs falling into Microscale projects (up to 5 MW): Documentation to support the conditions satisfied based on "Guidelines for demonstrating additionality of microscale project activity", version 04, Annex 26 of EB 68; or For CPAs as small scale project activities: ☐ Evidences that at least one of the barriers described in the section B.5 (according to the "Guidelines on the demonstration of additionality of small-scale project activities", Version 09.0 annex 27, EB 68 or the latest version at the time of inclusion) would prevent the implementation of the proposed CPAs. CPA shall provide all relevant	☐ Yes ☐ No

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
	version at the time of inclusion) would prevent the implementation of the proposed CPAs.	documents to substantiate the barrier analysis put forth in section B.5 of the PoA-DD to DOE at time of inclusion.	
H.	The CPA shall conduct an an Environmental Analysis (if mandated by law) at CPA level. This shall be carried out prior to the inclusion.	The following document shall be provided: If law / regulations mandate environmental analysis: ☐ Copy of environmental analysis report. If there is no law / regulation to mandate environmental analysis: ☐ Declaration from CPA implementer regarding applicable laws for the CPA and explanation why environmental analysis is not required.	☐ Yes ☐ No
I.	CPA of the PoA shall be within the threshold (i.e. emission reduction of less than or equal to 60 kilotons of CO_2 equivalent annually) as per the §14 of applied Baseline and Monitoring Methodology AMS III.H version 16.	The CPA implementer and CME shall consider this condition in the CPA DD and Emission reduction spread sheet.	☐ Yes ☐ No
J.	Confirmation that the CPA is not registered or being registered as a stand-alone CDM project outside of this PoA, a bundled CDM Project Activity or another registered PoA. The CPA shall not lead to double counting of emission reductions.	The following document shall be provided: ☐ Declaration from the CPA Implementer confirming that the project is not registered or in the process of being registered as a stand-alone CDM project, outside of the PoA, a bundled CDM Project Activity or another registered PoA. And: ☐ Confirmation described in the CPA-DD that states that the project is not registered or in the process of being registered as a stand-alone CDM project, outside of the PoA. ☐ Confirmation check by reviewing the website of the	☐ Yes ☐ No

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
		UNFCCC.	
K.	Confirmation that the CPA is not a de-bundled component of another large-scale CPA or CDM project activity as per latest guidance given by the CDM Executive Board	The following document shall be provided: ☐ Declaration from the CPA Implementer confirming that the CPA is not a de-bundled component of another large-scale CPA or CDM project activity as per latest guidance given by the CDM Executive Board. And: ☐ Confirmation that the CPA is not a de-bundled component of another large-scale CPA or CDM project activity as per latest guidance given by the CDM Executive Board shall be provided in the CPA-DD.	☐ Yes ☐ No
L.	Confirmation on involvement of public funding or ODA from Annex I Parties in CPA	The following document shall be provided: ☐ Declaration from the CPA Implementer regarding the no involvement of public funding or ODA from Annex I Parties. And: ☐ Confirmation in the CPA-DD regarding no involvement of public funding or ODA from Annex I Parties.	☐ Yes ☐ No
M.	A CPA level local stakeholder's consultation has to be carried out prior to inclusion.	The following document shall be provided: ☐ Meeting minutes of the stakeholder consultation.	☐ Yes ☐ No
N.	The CPA implementer shall be duly registered by the Indonesian authorities prior to inclusion	The following document shall be provided: ☐ Business license of the CPA Implementer issued by Indonesian local authorities.	☐ Yes ☐ No
O.	The CPA shall be in conformance to statutory requirements of Indonesia.	The following document shall be provided: ☐ Business license of the CPA Implementer issued by Indonesian local authorities.	☐ Yes ☐ No
P.	Confirmation on the crediting	Confirmation described in the	

Nr.	Eligibility criteria description	Information requirement	Eligibility check outcome (to be confirmed at CPA level by the CME)
	period of the CPA which shall not exceed the length of the PoA (28 years) regardless of the time of inclusion of CPA in the PoA	CPA-DD that states that the crediting period of the CPA shall not exceed the length of the PoA.	☐ Yes ☐ No
Q.	The CPA shall not involve biomass storage under anaerobic conditions.	The following document shall be provided: ☐ Declaration from the CPA Implementer that the CPA does not involve biomass storage under anaerobic conditions.	☐ Yes ☐ No

For CPA that also apply scenario E, the following additional eligibility criteria shall be met. CPA that only apply scenario 1 or 2 do not need to comply with the below mentioned additional criteria.

Table II.B.5.2 – additional eligibility criteria for a CPA to enrol in the PoA

R.	CPA of the PoA shall be within the threshold (i.e. combined installed electricity generation capacity less than or equal to 15 MW) the limit for small-scale project activities	Any of the following documents shall be provided: ☐ Feasibility Study / Project Proposal of the project that describes the project technology.	☐ Yes ☐ No ☐ Not applicable
S.	The CPA shall meet the applicability and other requirements of the methodology AMS.I.D Version 17.	As described in section E.2 of the PoA-DD the CPA shall meet all relevant requirements of the methodology and the required evidence documentation shall be provided to the DOE at the time of inclusion.	☐ Yes ☐ No ☐ Not applicable
T.	The plant must be connected to an Indonesian Electricity Grid.	Any of the following documents shall be provided: ☐ Feasibility Study / Project Proposal of the project that describes the project technology. ☐ Power Purchase Agreement.	☐ Yes ☐ No ☐ Not applicable

As per eligibility criteria defined in section B.2 of the PoA-DD the CPA under this PoA shall demonstrate additionality based on the information provided in section B.5 of this PoA-DD (below).

A typical CPA can use any or a combination of the approaches described below to demonstrate additionality. Compliance with one of the approaches described below shall constitute that the particular eligibility criteria for demonstration of additionality has been met.

A. MICROSCALE PROJECTS

In the cases where the emission reductions resulting from the methane recovery activity (i.e. Type III component) is at a scale of no more than 20 ktCO_2e per year and (in case the project is generating electricity with the biogas that was recovered) the installed capacity of the power generation is no more than 5 MW installed electricity generation capacity, the CPA implementer may demonstrate the

additionality of the CPA as per the "Guidelines for Demonstrating Additionality of Microscale Project Activities" version 04, Annex 26 of EB 68.

According to the "Guidelines for Demonstrating Additionality of Microscale Project Activities" (version 04, Annex 26 of EB 68) a project activity is additional if it falls into the following category of projects:

For this test, the size of the renewable project is chosen as per the generator rated capacity, while the determination if the project Type III component emission reduction is at a scale of no more than 20 ktCO_2e per year is based on the emission reduction spread sheet that is prepared for the particular CPA and is validated by the DOE. The definition of the special underdeveloped zone as per the list under the State Minister of Underdeveloped Zone Development Decree No. 001 about National Strategy for Underdeveloped Zone Development issued in 2005 [41] .The list identified by the Government before 28 May 2010 as per paragraph 2-a of EB 54 annex 15 will remain unchanged during the lifetime of the PoA. The location of the CPA will be determined as the location of the powerhouse.

Test	Yes/No/Not applicable
Type III component emission reduction is at a scale of no more than 20 ktCO_2e per year	
CPA capacity is below or equal to 5 MW	
CPA is undertaken in a special underdeveloped zone as defined by State Minister of Underdeveloped Zone Development Decree No. 001 issued in 2005	

For CPA selecting this approach, justification shall be described in the CPA-DD to confirm the compliance with one of the above conditions.

B. SMALL SCALE PROJECT ACTIVITIES

All small scale projects may follow the approaches defined in Attachment A to Appendix B to Annex II of 4/CMP.1 ("Attachment A") to prove additionality. Herein all CPAs will have to demonstrate the presence of an investment barrier, i.e. a financially more viable alternative to the project activity would have led to higher emissions

Within the CPA-DD template an overview will provided with the main financial parameters as per framework given below. The detailed investment calculation, indicating all assumptions will be provided to the DOE at time of inclusion of the CPA.

In application of the Investment Analysis, an appropriate financial/economic indicator and benchmark will be selected for the programme activity. Project IRR and Equity IRR are considered appropriate financial/economic indicators. The weighted average cost of capital (WACC) and Return on Equity (ROE) are considered suitable benchmarks. The financing data used to calculate the benchmarks will be obtained from public sources.

The investment analysis will be based on the project details considered by the board when approving the investment in the project. Therefore, the inputs to the investment analysis will be considered relevant to the timing of the investment decision.

[41] The State Minister of Underdeveloped Zone Development Decree No. 001 issued in 2005 about National Strategy for Underdeveloped Zone Development, http://www.kemenegpdt.go.id/hukum/KEPMEN_001-2005.pdf.

The CPA-DD-Specific will provide information within the following framework:

Table II.B.5.3 – additionality framework

Step	Description	Application to a typical CPA
9.	Choose a method for demonstrating additionality from the Tool for the demonstration and assessment of additionality.	Step 2 (Investment Analysis) of the Tool for the Demonstration and assessment of additionality, Version 6.0.0 will be applied to a typical CPA.
10.	Apply Benchmark Analysis: Sub Step 2b: Option III of the Tool for the demonstration and assessment of additionality.	Step 2b Option III (Benchmark Analysis) of the Tool for the Demonstration and assessment of additionality, Version 6.0.0 will be applied.
11.	Identify the financial/economic indicator, such as IRR, most suitable for the project type and decision context.	A typical CPA will apply one of the following two financial indicators: (a) Project IRR (b) Equity IRR
12.	Determine financial benchmark	The benchmark for Project IRR is calculated as per Guidance on the Assessment of Investment Analysis and will typically be: (a) Weighted Average Cost of Capital (WACC) (b) commercial bank lending rate A typical benchmark for Equity IRR is: (c) Return on Equity
13.	Present a clear comparison of the financial indicator and the financial benchmark. If the CDM project activity has a less favourable indicator (e.g. lower IRR) than the benchmark, then the CDM project activity cannot be considered as financially attractive.	A typical CPA will have a financial indicator (without CDM) lower than the financial benchmark.
14.	Include a Sensitivity Analysis to show that the conclusions regarding the financial/economic attractiveness are robust to reasonable variations in the critical assumptions. After the sensitivity analysis, it must be concluded that the proposed CDM project activity is unlikely to be financially/economic attractive.	A typical CPA will show through the sensitivity analysis that the conclusion regarding the financial economic attractiveness is robust to reasonable variations in the critical assumptions.

15.	Determine sources of data for calculating the benchmark	Typical sources of financial data for calculating the WACC (Return on Equity and Cost of Debt) are: (a) Return on Equity (ROE) published by the national stock marker for companies that face a similar risk profile to the CPA project. (b) Cost of Debt based commercial lending rates from public sources Typical sources of financial data for Return on Equity are: (c) Return on Equity (ROE) published by for companies that face a similar risk profile to the CPA.
16.	Calculation and comparison of financial indicators	Calculation of the financial indicator identified in step 3 above will apply all the following requirements of the tool: (a) Include all relevant costs (including, for example, the investment cost, the operations and maintenance costs), and revenues (excluding CER revenues, but possibly including inter alia subsidies/fiscal incentives, ODA, etc, where applicable), and, as appropriate, non-market cost and benefits in the case of public investors if this is standard practice for the selection of public investments in the host country. (b) Present the investment analysis in a transparent manner and provide all the relevant assumptions, so that a reader can reproduce the analysis and obtain the same results. Refer to all critical techno-economic parameters and assumptions (such as capital costs, fuel prices, lifetimes, and discount rate or cost of capital). Justify and/or cite assumptions in a manner that can be validated by the DOE. (c) In calculating the financial/economic indicator, the projects risks can be included through the cash flow pattern, subject to project-specific expectations and assumptions (e.g. insurance premiums can be used in the calculation to reflect specific risk equivalents).

Key criteria and data required for assessing the additionality of the CPA are summarised below and provided in the CPA-DD specific. A detailed investment analysis spread sheet will be submitted to the DOE at the time of inclusion of each CPA. Note that items may be added in this section and the respective tables for each CPA, to accommodate a clear and transparent overview of the parameters used for the investment analysis. In each CPA the sources used shall be clearly indicated.

Table II.B.5.4 – investment analysis description

No.	Description	Units	Value	Possible Source
20.	Date of Board Decision/Investment decision	Date	Value to be determined at CPA level.	Company Board Minutes
21.	Yearly Methane Production (Optional)	Nm^3/year		Based on available data at the time of investment decision. This may include one of the following: (a) Third Party Report (i.e. Third Party Yield Analysis, Feasibility Study, etc.) (b) Estimated based on direct site measurements of COD and W/W flow. Together with technology efficiency and conversion factor based on similar plants verified operational records. (c) Historical factory records of operations. Such as production records and ratio of wastewater per production unit measurements. Also COD measurements.
22.	Yearly Electricity Production (Optional)	MWh/ year	Value to be determined at CPA level.	Based on available data at the time of investment decision. This may include one of the following: (a) Third Party Report (i.e. Third Party Yield Analysis, Feasibility Study, etc.) (b) Estimated based on direct site measurements of COD and W/W flow. Together with technology efficiency and conversion factor based on similar plants verified operational records. Heat value of methane and Engine/Generator efficiency. Installed capacity of engine. (c) Historical factory records of operations. Such as production records and ratio of wastewater per production unit measurements. Also COD measurements. Heat value of methane and Engine/Generator efficiency. Installed capacity of engine.
23.	Percentage of Biogas Flared	%	Value to be determined at CPA level.	This may include one of the following: (a) Historical records of similar project structure. (b) Calculated from mismatch in supply/demand (c) Assessment by third party expert
24.	Biogas Sale/Income Price	Project specific	Value to be determined at CPA level.	Will be applied for the specific project: (a) Project biogas sale agreements or equivalent, (b) In the absence of such sale agreement where the project owner is also the biogas consumer, market value of substituted fuel based on historical national (or if unavailable international) prices of fuel that will be substituted. National conversion factors (or if unavailable international) for fuel to be applied.

25.	Electricity Tariff	Project Specific	Value to be determined at CPA level.	(a) If sold to a national grid, based on National Power Regulation framework. (b) If sold directly to a consumer based on the sales agreement (c) In the absence of such sale agreement where the project owner is also the electricity consumer, equivalent tariff that the consumer can buy electricity from the grid.
26.	Escalation of Tariff	%	Value to be determined at CPA level.	This may include one of the following: (a) The sales agreement (b) Based on nation CPI figures
27.	Residual value of equipment	IDR	Value to be determined at CPA level.	This may include one of the following: (a) Based on the contractual agreements for equipment transfer (b) Base on national accounting practices for depreciation, where the equipment is fully depreciated by the end of the lifetime of the asset, the value is zero.
28.	Emission Reductions	tCO_2e	Value to be determined at CPA level.	(a) As estimate in the CPA-DD
29.	CER sale price	€	Value to be determined at CPA level.	This may include one of the following: (a) Historical Prices (b) Third party estimates
30.	Conversion Rate	€/IDR	Value to be determined at CPA level.	This may include one of the following: (a) Bank of Indonesia (b) Other public exchange sources
31.	CPI (O&M escalation rate)	%	Value to be determined at CPA level.	This may include one of the following: (a) Estimates of national CPI (b) Investment Memorandum (c) Escalation as agreed in contract
32.	Percentage of Debt Financing	%	Value to be determined at CPA level.	This may include one of the following: (a) CDM Guidelines Default Value (b) Project Financing Structure (if available at time of investment decision)
33.	Percentage of Equity Financing	%	Value to be determined at CPA level.	This may include one of the following: (a) CDM Guidelines Default value (b) Project Financing Structure (if available at time of investment decision)

34.	Total Investment Cost	IDR	Value to be determined at CPA level.	This may include one of the following: (a) Board Minutes (budget) (b) Third Party Report (i.e. feasibility study) (c) Quotation (d) EPC Contract
35.	Total Operation and Maintenance Cost	IDR	Value to be determined at CPA level.	This may include one of the following: (a) Accounting Records for O&M costs (b) Third Party Report (i.e. feasibility study) (c) Quotation (d) Service Agreement
36.	Operational Lifetime (Supply Period)	Years	Value to be determined at CPA level.	This may include one of the following: (a) Equipment Contracts (b) Feasibility Study (c) Declaration by Equipment Supplier/Consultant
37.	Income tax	%	Value to be determined at CPA level.	This may include one of the following: (a) relevant regulation as published by the government.
38.	Interest rate	%	Value to be determined at CPA level.	This may include one of the following: (a) bank loan agreement (b) latest financing proposal from bank (c) reference rate as published by the bank or central bank.

A typical CPA will have a financial indicator (without CDM) lower than the financial benchmark, in that case the eligibility criteria specified in section B.2 is met. A typical CPA will show through the sensitivity analysis that the conclusion regarding the financial economic attractiveness is robust to reasonable variations in the critical assumptions.

The PoA investment spread sheet template is applied to the CPA to demonstrate that the project is not financially feasible without the revenue from CERs. The outcomes of the financial analysis spread sheet are shown below:

The project returns need to be compared with an appropriate benchmark. Following the "Guidelines on the Assessment of Investment Analysis (Annex 5 of EB 62)" the appropriate benchmark shall be determined for the CPA, with justification.

A table shall be provided in the CPA-DD to clearly explain the outcome of the investment analysis:

Table II.B.5.5 – investment analysis outcome

Financial Parameter	CPA Value
Financial Benchmark	XX%
[Benchmark] without CDM	XX%

The results of the financial analysis spread sheet demonstrate that the project is not financially feasible without the revenue from CERs. The financial analysis is robust to reasonable variations of +10% and -10% in the critical assumptions, as is shown in the table below:

Parameters	Sensitivity		
	-10%	0%	10%
All applicable parameters to be listed here, e.g. power sales, biogas production, investment cost etc.	XX%	XX%	XX%
	XX%	XX%	XX%
	XX%	XX%	XX%
Benchmark	XX%		

An additional analysis shall be conducted to demonstrate at what value each scenario included in the sensitive analysis changes such that the IRR reaches the benchmark. The results are shown in table below which also demonstrates that each of these scenarios is high unlikely to occur.

Scenario	Percentage at which IRR reach benchmark	Likelihood of occurrence
All applicable parameters to be listed here, e.g. power sales, biogas production, investment cost etc.	XX%	An explanation on the likelihood of reaching this variation shall be provided here.
	XX%	An explanation on the likelihood of reaching this variation shall be provided here.
	XX%	An explanation on the likelihood of reaching this variation shall be provided here.

As per paragraph 20 of the "Guidelines on the Assessment of Investment Analysis", EB 62, Annex 5, "Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude),...".

Conclusion

A conclusion shall be provided on the additionality of the specific CPA, including confirmation on the (non) eligible for inclusion as per eligibility criteria specified in the registered PoA-DD.

Documentation relevant to substantiation of the investment barrier shall be provided to the DOE at time of inclusion.

D.6. Estimation of emission reductions of a generic CPA
D.6.1. Explanation of methodological choices
>>

Emission reductions AMS.III.H
A typical CPA may be one of the technological measures as explained in paragraph 1 of the baseline and monitoring methodology AMS-III.H "Methane Recovery in Wastewater Treatment" (version 16). Following are the methodological choices used for calculating emission reductions.

Baseline Emissions
Baseline emissions will include greenhouse gas (GHG) emissions associated with the following sources:
(a) Emissions associated with electricity or fuel consumption in the baseline wastewater treatment system- The CPA will follow the "Tool to calculate baseline, project and/or leakage emissions for electricity consumption" and/or "Tool to calculate project or leakage emissions for fossil fuel combustion" for calculating emissions associated with electricity or fuel consumption.

(b) Emissions associated with baseline wastewater treatment not equipped with a biogas recovery system and which is affected by the project activity treatment system- organic content in the wastewater will be decomposed in the baseline treatment system and would result in generation of methane. Since the baseline wastewater system is not equipped with methane recovery system, it will result in GHG emissions into the atmosphere. Baseline emissions will account for this source of emissions.

(c) Emissions associated with discharge of treated wastewater into sea/river/lake- this is in relation to the amount of chemical oxygen demand (COD) present in the wastewater even after being treated by the baseline wastewater system. If such treated wastewater is discharged to downstream such as sea/river/lake, baseline emissions to account for the un-removed COD in the treated wastewater.

(d) Emissions associated with anaerobic decay of final sludge- if in the baseline scenario, the sludge is allowed to decay under anaerobic conditions it will result in generation of methane which will be emitted into the atmosphere, baseline emissions will account for this source of emissions.

In determining the baseline emissions, past historic records (e.g. COD removal efficiency (CODin and CODout,) of the wastewater treatment systems, the amount of dry matter in sludge, power and electricity consumption per m^3 of wastewater treated, the amount of final sludge generated per tonne of COD removed) of at least one year prior to the project implementation shall be used. If the historical data is not available or for the case of Greenfield projects and capacity addition projects, a baseline measurement campaign should be undertaken for at least 10 days before project implementation. The average values from the measurement campaign shall be multiplied by 0.89 to account for the uncertainty range (30% to 50%) and used for estimating emissions associated with the prevailing baseline. Sludge treatment is not included in this PoA, hence SGR_{BL} and SGR_{PJ} do not need to be determined.

For existing wastewater treatment plant that has been operating for at least three years and if one year of historical data is not available, the procedures described in paragraph 27 of AMS.III.H shall be followed.

For Greenfield and capacity addition projects, procedures described in paragraph 28 of AMS.III.H version 16 shall be followed. The approach (e.g. past historic records, 10-day measurement campaign, value from manufacturer/designer) and the associated data which are selected and applied in determining the baseline emissions shall be recorded under Annex 3 of the CPA-DD.

Emission reductions (ER_y)

Total emission reductions of the CPA will be calculated as a sum of emission reductions from methane recovery in wastewater treatment (technology scenario 1 and 2) and optionally emission reduction obtained through combustion of recovered methane for electricity generation (scenario E).

Emission reductions are calculated as follows:
$ER_y = ER_{grid,y} + ER_{methane,y}$

Where:
ER_y = Total emission reductions of the project in year y (tCO_2e/year)
$ER_{grid,y}$ = Emission reductions from electricity generation in year y (tCO_2e/year)
$ER_{methane,y}$ = Emission reductions from methane recovery in wastewater treatment in year y (tCO_2e/year)

Below are the methodological choices used for calculating emission reductions baseline and monitoring methodology AMS-III.H "Methane Recovery in Wastewater Treatment" (version 16).

Baseline emissions (AMS-III.H)
Baseline emissions for the systems affected by the project activity may consist of:

(i) Emissions on account of electricity or fossil fuel used ($BE_{power,y}$);

(ii) Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$);

(iii) Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$);

(iv) Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$);

(v) Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$).

Baseline emissions are calculated as follows:

$$BE_{methane,y} = \{BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,dischage,y} + BE_{s,final,y}\}$$

Eq. (1) of AMS-III.H Version 16

Where:

$BE_{methane,y}$	Baseline emissions from methane recovery in wastewater treatment 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* (tCO_2e)
$BE_{ww,dischage,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year *y* (tCO_2e). The value of this term is zero for the case 1 (b)
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year *y* (tCO_2e). If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application in the baseline

scenario, this term shall be neglected

i. Emissions on account of electricity or fossil fuel used ($BE_{power,y}$);

$BE_{power,y}$ will be determined as per procedures described in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". $BE_{power,y} = BE_{EC,y}$

$$BE_{EC,y} = \sum_j EC_{BE,k,y} \times EF_{EL,k,y} \times \left(1 + TDL_{k,y}\right)$$ **Eq. 1 of the Tool**[42]

Where:

$BE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2e/yr)
$EC_{BE,k,y}$	Quantity of electricity consumed by the project electricity consumption source k in year y (MWh/yr)
$EF_{EL,k,y}$	Emission factor for electricity generation for source k in year y (tCO_2/MWh)
$TDL_{k,y}$	Average technical transmission and distribution losses for providing electricity to source k in year y

Under scenario A of the tool, option A1 is being used to calculate the CO_2 emission factor of grid electricity. As per scenario A1, the emission factor is the combined margin emission factor of the grid, calculated as per the guidelines provided under the latest version of "Tool to calculate emission factor for an electricity emission".

Scenario B: In case the electricity consumption is from an off-grid captive power plant: The emission factor $EF_{EL,k,y}$ is determined as zero if all equipment/devices in the project treatment facility are powered with power gained from biogas. Else and corresponding to option B2 offered by the tool an emission factor of 0.4 tCO_2e/MWh will be assumed.

Scenario C: In case of baseline electricity consumption from the grid and (a) fossil fuel fired captive power plant(s): The emission factor $EF_{ELk,y}$ is determined according to Scenario A, if the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant or according to Scenario B, if the project activity only affects the quantity of electricity that is supplied from the captive power plant and not the quantity of electricity that is supplied from the grid. Else, i.e. both sources are affected by the project activity, the more conservative value between Scenario A and Scenario B is determined as $EF_{EL,k,y}$. Under current conditions this is the value from Scenario B: $EF_{ELk,y} = 1.3\ tCO_2e/MWh$

General: In the CPA-DD the scenario which applies to the project activity will be clearly described and relevant evidence will be provided to the DOE. In case of doubts the more conservative value among the values of Scenarios A and B shall be adopted.

In line with Scenario B, when all project equipment is powered with power from captured biogas this

[42] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

project emission source can be neglected as long as the electricity export to the grid is the net electricity export or CERs are not claimed for the electricity export.

CPAs of the PoA shall calculate the combined margin emission factor at the time of inclusion and that emission factor shall be fixed ex-ante for the CPA.

For the Average technical transmission and distribution losses for providing electricity to source j in year y($TDL_{k,y}$), CPAs of the PoA shall consider the default value as mentioned in the tool, as a conservative and simplified approach.

ii. Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$);

Methane emissions from the baseline wastewater treatment systems affected by the project ($BE_{ww,treatment,y}$) are determined using the COD removal efficiency of the baseline plant:

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

Eq. (2) of AMS-III.H Version 16

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
$COD_{\inf low,i,y}$	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 26, 27 or 28 below
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems *i* (*MCF* values as per Table III.H.1)
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)[43]
UF_{BL}	Model correction factor to account for model uncertainties (0.89)[44]
GWP_{CH4}	Global Warming Potential for methane (value of 21)

If the baseline treatment system is different from the treatment system in the project scenario, the monitored values of the COD inflow during crediting period will be used to calculate the baseline emissions *ex post*.

[43] Project activities may use the default value of 0.6 kg CH_4/kg BOD, if the parameter $BOD_{5,20}$ is used to determine the organic content of the wastewater. In this case, baseline and project emissions calculations shall use BOD instead of COD in the equations, and the monitoring of the project activity shall be based in direct measurements of $BOD_{5,20}$, i.e. the estimation of BOD values based on COD measurements is not allowed.

[44] Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

iii. Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$);

Methane emissions from the baseline sludge treatment systems affected by the project activity are determined using the methane generation potential of the sludge treatment systems:

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

Eq. (3) of AMS-III.H Version 16

Where:

$S_{j,BL,y}$	Amount of dry matter in the sludge that would have been treated by the sludge treatment system *j* in the baseline scenario (t). For *ex ante* estimation, forecasted sludge generation volume or the designed capacity of the sludge treatment facility can be used. However, the *ex post* emissions reduction calculation shall be based on the actual monitored volume of treated sludge
j	Index for baseline sludge treatment system
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[45] shall be used
$MCF_{s,treatment,BL,j}$	Methane correction factor for the baseline sludge treatment system *j* (*MCF* values as per Table III.H.1)
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)

If the baseline wastewater treatment system is different from the treatment system in the project scenario, the sludge generation rate (amount of sludge generated per unit of COD removed) in the baseline may differ significantly from that of the project scenario. For example, it is known that the amount of sludge generated in aerobic wastewater systems is larger than in anaerobic systems, for the same COD removal efficiency. Therefore, for these cases, the monitored values of the amount of sludge generated during the crediting period will be used to estimate the amount of sludge generated in the baseline, as follows:

$$S_{j,BL,y} = S_{l,PJ,y} * \frac{SGR_{BL}}{SGR_{PJ}}$$

Eq. (5) of AMS-III.H Version 16

Where:

$S_{l,PJ,y}$	Amount of dry matter in the sludge treated by the sludge treatment system *l* in year *y* in the project scenario (t)
SGR_{BL}	Sludge generation ratio of the wastewater treatment plant in the baseline scenario (tonne of dry matter in sludge/t COD removed). This ratio will be determined as per paragraphs 26, 27 or 28 below
SGR_{PJ}	Sludge generation ratio of the wastewater treatment plant in the project scenario (tonne of dry matter in sludge/t COD removed). Calculated using the

[45] The IPCC default values of 0.05 for domestic sludge (wet basis, considering a default dry matter content of 10%) or 0.09 for industrial sludge (wet basis, assuming dry matter content of 35%), were corrected for dry basis.

monitored values of COD removal (i.e. $COD_{inflow,i}$ minus $COD_{outflow,i}$) and sludge generation in the project scenario

iv. Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$);

Methane emissions from degradable organic carbon in treated wastewater discharged in e.g. a river, sea or lake in the baseline situation are determined as follows:

$$BE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,ww} * UF_{BL} * COD_{ww,discharge,BL,y} * MCF_{ww,BL,discharge}$$

Eq. (6) of AMS-III.H Version 16

Where:

$Q_{ww,y}$	Volume of treated wastewater discharged in year *y* (m^3)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
$COD_{ww,discharge,BL,y}$	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the baseline situation in the year *y* (t/m^3). If the baseline scenario is the discharge of untreated wastewater, the COD of untreated wastewater shall be used
$MCF_{ww,BL,discharge}$	Methane correction factor based on discharge pathway in the baseline situation (e.g. into sea, river or lake) of the wastewater (fraction) (*MCF* values as per Table III.H.1)

To determine $COD_{ww,discharge,BL,y}$: if the baseline treatment system(s) is different from the treatment system(s) in the project scenario, the monitored values of the COD inflow during crediting period will be used to calculate the baseline emissions *ex post*. The outflow COD of the baseline systems will be estimated using the removal efficiency of the baseline treatment systems, estimated as per paragraphs 26, 27 or 28 of AMS.III.H.

v. Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$).

Methane emissions from anaerobic decay of the final sludge produced are determined as follows:

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

Eq. (7) of AMS-III.H Version 16

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 above
$MCF_{s,BL,final}$	Methane correction factor of the disposal site that receives the final sludge in the baseline situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
UF_{BL}	Model correction factor to account for model uncertainties (0.89)

If the baseline wastewater treatment system is different from the treatment system in the project scenario, the sludge generation rate (amount of sludge generated per unit of COD removed) in the baseline may differ significantly from that of the project scenario. For example, it is known that the amount of sludge generated in aerobic wastewater systems is larger than in anaerobic systems, for the same COD removal efficiency. Therefore, for these cases, the monitored values of the amount of sludge generated during the crediting period will be used to estimate the amount of sludge generated in the baseline, using equation 5 that is defined above.

Project Activity Emissions (AMS-III.H)

Project activity emissions from the systems affected by the project activity are:

(ix) CO_2 emissions from electricity and fuel used by the project facilities ($PE_{power,y}$);

(x) Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project scenario ($PE_{ww,treatment,y}$);

(xi) Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$);

(xii) Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$);

(xiii) Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$);

(xiv) Methane fugitive emissions due to inefficiencies in capture systems ($PE_{fugitive,y}$);

(xv) Methane emissions due to incomplete flaring ($PE_{flaring,y}$);

(xvi) Methane emissions from biomass stored under anaerobic conditions which would not have occurred in the baseline situation ($PE_{biomass,y}$).[46]

The project emissions are calculated using the following equations:

$$PE_{methane,y} = \left\{ \begin{matrix} PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + \\ PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y} \end{matrix} \right\}$$ **Eq. (8) of AMS-III.H Version 16**

Where:

$PE_{methane,y}$ Project activity emissions from methane recovery in wastewater treatment in year y (tCO_2e)

[46] For instance in the baseline situation Palm Kernel Shells (PKS) are used as fuel in a boiler. In the project situation PKS is replaced by biogas captured at a wastewater treatment system. The PKS will no longer be used as fuel in the boiler, but sold on the market. Before it is sold it is likely it will be stored for a period of time (few months or longer) on site which might lead to methane emissions from anaerobic decay.

$PE_{power,y}$ Emissions from electricity or fuel consumption in the year y (tCO_2e). These emissions shall be calculated as per paragraph 19, for the situation of the project scenario, using energy consumption data of all equipment/devices used in the project activity wastewater and sludge treatment systems and systems for biogas recovery and flaring/gainful use

$PE_{ww,treatment,y}$ Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (tCO_2e). These emissions shall be calculated as per equation 2 in paragraph 20, 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:

$MCF_{ww,treatment,PJ,k}$	Methane correction factor for project wastewater treatment system k (MCF values as per Table III.H.1)
$\eta_{,PJ,k,}$	Chemical oxygen demand removal efficiency of the project wastewater treatment system k in year y (t/m^3), measured based on inflow COD and outflow COD in system k

$PE_{s,treatment,y}$ Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year y (tCO_2e). These emissions shall be calculated as per equations 3 and 4 in paragraph 22, 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:

$S_{l,PJ,y}$	Amount of dry matter in the sludge treated by the sludge treatment system l in the project scenario in year y (t)
$MCF_{s,treatment,l}$	Methane correction factor for the project sludge treatment system l (MCF values as per Table III.H.1)

$PE_{ww,discharge,y}$ Methane emissions from degradable organic carbon in treated wastewater in year y (tCO_2e). These emissions shall be calculated as per equation 6 in paragraph 24, 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:

$COD_{ww,discharge,PJ,y}$	Chemical oxygen demand of the treated wastewater discharged into 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 sea, river or lake) (MCF values as per Table III.H.1)

$PE_{s,final,y}$ Methane emissions from anaerobic decay of the final sludge produced in year y (tCO_2e). These emissions shall be calculated as per equation 7 in paragraph 25, 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:

$MCF_{s,PJ,final}$	Methane correction factor of the disposal site that receives the final sludge in the project situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
$S_{final,PJ,y}$	Amount of dry matter in final sludge generated by the project wastewater treatment systems in the year y (t)

$PE_{fugitive,y}$ Methane emissions from biogas release in capture systems in year y, calculated as per paragraph 30 (tCO_2e)

$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year *y* (tCO_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 CH4. However, the *ex post* emission reduction shall be calculated as per the"Tool to determine project emissions from flaring gases containing methane" by using actual monitored data
$PE_{biomass,y}$	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 "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (tCO_2e)

(xvii) **CO_2 emissions from electricity and fuel used by the project facilities ($PE_{power,y}$);**

$PE_{power,y}$ Emissions from electricity or fuel consumption in the year *y* (tCO_2e). These emissions will be calculated as per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

<u>Project emissions from electricity consumption</u>

A typical CPA of the PoA will consume electricity at the project site to run various equipment. The emission on the account of electricity ($PE_{power,y} = PE_{EC,y}$)consumption has been designed to calculate in accordance with the "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01).

The tool is applicable if one out of the following three scenarios applies to the sources of electricity consumption:

- Scenario A: Electricity consumption from the grid
- Scenario B: Electricity consumption from (an) off grid fossil fuel fired captive power plant
- Scenario C: Electricity consumption from the grid and fossil fuel fired captive power plant.

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times \left(1 + TDL_{j,y}\right)$$ **Eq. 1 of the Tool**[47]

Where:

$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO_2e/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO_2/MWh)

[47] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

Under scenario A of the tool, option A1 is being used to calculate the CO_2 emission factor of grid electricity. As per scenario A1, the emission factor is the combined margin emission factor of the grid, calculated as per the guidelines provided under the latest version of "Tool to calculate emission factor for an electricity emission".

Scenario B: In case the electricity consumption is from an off-grid captive power plant: The emission factor $EF_{EL,j,y}$ is determined as zero if all equipment/devices in the project treatment facility are powered with power gained from biogas. Else and corresponding to option B2 offered by the tool an emission factor of 0.4 tCO_2e/MWh will be assumed.

Scenario C: In case of baseline electricity consumption from the grid and (a) fossil fuel fired captive power plant(s): The emission factor $EF_{EL,j,y}$ is determined according to Scenario A, if the project activity only affects the quantity of electricity that is supplied from the grid and not the operation of the captive power plant or according to Scenario B, if the project activity only affects the quantity of electricity that is supplied from the captive power plant and not the quantity of electricity that is supplied from the grid. Else, i.e. both sources are affected by the project activity, the more conservative value between Scenario A and Scenario B is determined as $EF_{EL,j,y}$. Under current conditions this is the value from Scenario B: $EF_{EL,j,y} = 1.3\ tCO_2e/MWh$

General: In the CPA-DD the scenario which applies to the project activity will be clearly described and relevant evidence will be provided to the DOE. In case of doubts the more conservative value among the values of Scenarios A and B shall be adopted.

In line with Scenario B, when all project equipment is powered with power from captured biogas this project emission source can be neglected as long as the electricity export to the grid is the net electricity export or CERs are not claimed for the electricity export.
CPAs of the PoA shall calculate the combined margin emission factor at the time of inclusion and that emission factor shall be fixed ex-ante for the CPA.

For the Average technical transmission and distribution losses for providing electricity to source j in year y($TDL_{j,y}$), CPAs of the PoA shall consider the default value as mentioned in the tool, as a conservative and simplified approach.

Fossil fuel usage

It is possible that fossil fuel is used in the project. In such cases relevant emissions shall be determined In case any electricity is generated using "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

Since fossil fuel (diesel, coal or FO) may be consumed CO_2 emission from fossil fuel combustion ($PE_{FC,y}$) should be calculated using the latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" Version 02 (EB 41, Annex 11). According to this Tool, 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:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad (1)^{48}$$

Where

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during year *y*(t CO_2e/yr)
$FC_{i,j,y}$	Is the quantity of fuel type *i* combusted in process *j* during year *y* (mass or volume unit/year)
$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *j*(t CO_2/mass or volume unit)
i	Are the fuel types combusted in process *j* during the year *y*

As the data on the chemical composition of the fossil fuel type *i* used by the CPA is not available. Thus, the option B of the Tool is adopted for calculation of the CO_2 emission coefficient $COEF_{i,y}$. The $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i* , as follows:

$$COEF_{i,y} = NCV_{i,y} \text{ x } EF_{CO2,i,y} \quad (4)^{49}$$

Where:

$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *y*(t CO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (t CO_2/GJ)
i	Are the fuel types combusted in process *j* during the year *y*

Fossil fuel consumption will be estimated ex-ante based on parameters available in the feasibility study report or a declaration from the technology supplier of each CPA. Actual fossil fuel consumption will be part of the monitoring plan of each CPA.

(xviii) **Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project scenario ($PE_{ww,treatment,y}$);**

$PE_{ww,treatment,y}$ Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y* (tCO_2e). These emissions shall be calculated as per equation 2 in paragraph 20, 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:

$MCF_{ww,treatment,PJ,k}$	Methane correction factor for project wastewater treatment system *k* (*MCF* values as per Table III.H.1)
$\eta_{,PJ,k,}$	Chemical oxygen demand removal efficiency of the project wastewater treatment system *k* in year *y* (t/m^3), measured based on inflow COD and outflow COD in system *k*

(xix) **Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$);**

$PE_{s,treatment,y}$ Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y* (tCO_2e). These emissions shall be

[48] Tool to calculate project or leakage CO2 emissions from fossil fuel combustion

[49] Tool to calculate project or leakage CO2 emissions from fossil fuel combustion

calculated as per equations 3 and 4 in paragraph 22, 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:

$S_{l,PJ,y}$	Amount of dry matter in the sludge treated by the sludge treatment system *l* in the project scenario in year *y* (t)
$MCF_{s,treatment,l}$	Methane correction factor for the project sludge treatment system l (*MCF* values as per Table III.H.1)

(xx) **Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$);**

$PE_{ww,discharge,y}$ Methane emissions from degradable organic carbon in treated wastewater in year *y* (tCO_2e). These emissions shall be calculated as per equation 6 in paragraph 24, 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:

$COD_{ww,discharge,PJ,y}$	Chemical oxygen demand of the treated wastewater discharged into 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 sea, river or lake) (*MCF* values as per Table III.H.1)

(xxi) **Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$);**

$PE_{s,final,y}$ Methane emissions from anaerobic decay of the final sludge produced in year *y* (tCO_2e). These emissions shall be calculated as per equation 7 in paragraph 25, 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:

$MCF_{s,PJ,final}$	Methane correction factor of the disposal site that receives the final sludge in the project situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
$S_{final,PJ,y}$	Amount of dry matter in final sludge generated by the project wastewater treatment systems in the year *y* (t)

(xxii) **Methane fugitive emissions due to inefficiencies in capture systems ($PE_{fugitive,y}$);**

Project activity emissions from methane release in capture systems are determined as follows:

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

$$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$$ **Eq. (9) of AMS-III.H Version 16**

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* (tCO_2e)

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

Eq. (10) of AMS-III.H Version 16

Where:

CFE_{ww} Capture efficiency of the biogas recovery equipment in the wastewater treatment systems (a default value of 0.9 shall be used)

$MEP_{ww,treatment,y}$ Methane emission potential of wastewater treatment systems equipped with biogas recovery system in year *y* (t)

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

Eq. (11) of AMS-III.H Version 16

Where:

$COD_{removed,PJ,k,y}$ The chemical oxygen demand removed[50] 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 (*MCF* values as per Table III.H.1)

UF_{PJ} Model correction factor to account for model uncertainties (1.12)

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

Eq. (12) of AMS-III.H Version 16

Where:

CFE_s Capture efficiency of the biogas recovery equipment in the sludge treatment systems (a default value of 0.9 shall be used)

$MEP_{s,treatment,y}$ Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year *y* (t)

$$MEP_{s,treatment,y} = \sum_{l} (S_{l,PJ,y} * MCF_{s,treatment,PJ,l}) * DOC_s * UF_{PJ} * DOC_F * F * 16/12$$

Eq. (13) of AMS-III.H Version 16

Where:

$S_{l,PJ,y}$ Amount of sludge treated in the project sludge treatment system *l* equipped with a biogas recovery system (on a dry basis) in year *y* (t)

$MCF_{s,treatment,PJ,l}$ Methane correction factor for the sludge treatment system equipped with biogas recovery equipment (*MCF* values as per Table III.H.1)

UF_{PJ} Model correction factor to account for model uncertainties (1.12)

---

50 Difference between the inflow COD and the outflow COD.

(d) Optionally a default value of 0.05 m³ biogas leaked/m³ biogas produced may be used as an alternative to calculations per equation 9 to 13.

(xxiii) **Methane emissions due to incomplete flaring ($PE_{flaring,y}$);**

For *ex ante* estimation, baseline emission calculation for wastewater and can be used but without the consideration of GWP for CH_4:

The ex ante estimation

$$PE_{flaring,y} = \sum_i (Q_{ww,i,y} * COD_{inflow,i,y} * \eta_{COD,BL,i} * MCF_{ww,treatment,BL,i}) * B_{o,ww} * UF_{BL}$$

Eq. (2) of AMS-III.H Version 16

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 26, 27 or 28 below
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems *i* (*MCF* values as per Table III.H.1)
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)

For CPA that plan to utilize biogas completely for combustion for electricity generation in the project activiy, then the $PE_{flaring}$ will be considered as zero for ex-ante emission reduction. s The *ex post* emission reduction will be calculated as per "Tool to determine project emissions from flaring gases containing methane" by using actual monitored data.

$PE_{flaring,y}$ Methane emissions due to incomplete flaring. The *ex post* emission reduction will be calculated as per "Tool to determine project emissions from flaring gases containing methane" by using actual monitored data.

Note that either a open or enclosed flare may be employed by the CPA.

Methane may be released as a result of incomplete combustion in the flare. To calculate project emissions from flaring of the biogas (PE_{flare}), the "Tool to determine project emissions from flaring gases containing methane" (version 01 approved at EB28) is applied.

For determination of the flare efficiency, a default value of 50% will be used for the calculation of project emissions from flaring gases if the CPA uses an open flare and a default flare efficiency of 90% will be employed if the CPA uses an enclosed flare.

The tool specifies 7 steps for calculation.

Step 1: Determination of the mass flow rate of the residual gas that is flared

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas.

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas. Alternatively, the tool provides a simplified approach to only measure the volumetric fraction of methane and to consider the deference to 100% as being nitrogen. The proposed project activity adopts this simplified approach.

Step 2 is not applicable because of the simplified approach taken where only the volumetric fraction of methane is measured.

Steps 3 & 4 are only applicable if the combustion efficiency of the flare is continuously monitored and are therefore not considered.

Step 5: Determination of methane mass flow rate in the residual gas on a dry basis

The quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions (normal conditions and dry or wet basis).

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n}$$ **Eq. 13 of Flaring Tool Version 01**

Where:

Parameter	Description	Unit
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour *h*	kg/h
$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour *h*	m^3/h
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the residual gas on dry basis in hour *h*	mg/m^3
$\rho_{CH4,n}$	Density of methane at normal conditions	kg/m^3

Step 6: Determination of the hourly flare efficiency

In case the project uses an open flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the flame is not detected for more than 20 minutes during the hour *h*.
- 50%, if the flare is detected for more than 20 minutes during the hour *h*.

In case the project uses an enclosed flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour *h* .
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h*, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour *h*.
- 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h* and the manufacturer's specifications on proper operation of the flare are met continuously during the hour *h*.

Step 7: Calculation of annual project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions from each hour *h*, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour *h* ($\rho_{flare,h}$), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times \left(1-\eta_{flare,h}\right) \times \frac{GWP_{CH4}}{1000}$$ **Eq. 15 of Flaring Tool Version 01**

Where:

Parameter	Description	Unit
$PE_{flare,y}$	Project emissions from flaring of the residual gas stream in year *y*	tCO_2e/yr
$TM_{RG,h}$	Mass flow rate of the methane in the residual gas in the hour *h*	kg/h
$\eta_{flare,h}$	Flare efficiency in hour *h*	fraction

(xxiv) **Methane emissions from biomass stored under anaerobic conditions which would not have occurred in the baseline situation ($PE_{biomass,y}$).**[51]

$PE_{biomass,y}$ Methane emissions from biogas 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 the biomass will be considered and be determined as per the procedure in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (tCO_2e)

Leakage (AMS-III.H)

If the technology is using equipment transferred from another facility, leakage effects at the site of the other activity are to be considered and estimated ($LE_{methane,y}$).

For programme of activities:

[51] For instance in the baseline situation Palm Kernel Shells (PKS) are used as fuel in a boiler. In the project situation PKS is replaced by biogas captured at a wastewater treatment system. The PKS will no longer be used as fuel in the boiler, but sold on the market. Before it is sold it is likely it will be stored for a period of time (few months or longer) on site which might lead to methane emissions from anaerobic decay.

In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.

Emission reductions ($ER_{methane,y}$) (AMS-III.H)

Emission reductions shall be estimated *ex ante* as follows:

$$ER_{methane,y,ex\,ante} = BE_{methane,y,ex\,ante} - \left(PE_{methane,y,ex\,ante} + LE_{methane,y,ex\,ante}\right)$$

Eq. (14) of AMS-III.H Version 16

Where:

$ER_{methane,y,ex\,ante}$	*Ex ante* emission reduction in year *y* (tCO_2e)
$LE_{methane,y,ex\,ante}$	*Ex ante* leakage emissions in year *y* (tCO_2e)
$PE_{methane,y,ex\,ante}$	*Ex ante* project emissions in year *y* calculated as paragraph 29 (tCO_2e)
$BE_{methane,y,ex\,ante}$	*Ex ante* baseline emissions in year *y* calculated as per paragraph 18 (tCO_2e)

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

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

For cases 1 (b), 1 (c), 1 (d) and 1 (f): it is possible that the project activity involves wastewater and sludge treatment 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 the actual monitored data for the project activity. The emission reductions achieved in any year are the lowest value of the following:

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

Eq. (15) of AMS-III.H Version 16

Where:

$ER_{methane,y,ex\,post}$	Emission reductions achieved by the project activity based on monitored values for year *y* (tCO_2e)
$BE_{methane,y,ex\,post}$	Baseline emissions calculated as per paragraph 18 using *ex post* monitored values
$PE_{methane,y,ex\,post}$	Project emissions calculated as per paragraph 29 using *ex post* monitored values
MD_y	Methane captured and destroyed/gainfully used by the project activity in the year *y* (tCO_2e)

In the case of flaring/combustion MD_y will be measured using the conditions of the flaring process:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP_{CH4}$$ **Eq. (16) of AMS-III.H Version 16**

Where:

$BG_{burnt,y}$	Biogas[52] flared/combusted in year *y* (m^3)
$w_{CH4,y}$	Methane content[13] 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% may be applied

For the cases listed in paragraph 1 such as:

Substitution of an aerobic wastewater or sludge treatment system with an anaerobic treatment system with methane recovery and combustion; and

Introduction of an anaerobic wastewater treatment system with methane recovery and combustion to an untreated wastewater stream.

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.

$$ER_{methane,y} = BE_{methane,y,ex\ post} - \left(PE_{methane,y,ex\ post} + LE_{methane,y,ex\ post}\right)$$

Eq. (17) of AMS-III.H Version 16

The historical records of electricity and fuel consumption, the COD content of untreated and treated wastewater, and the quantity of sludge produced by the replaced units will be used for the baseline calculation.

In case (a), if the volumetric flow and the characteristic properties (e.g. COD) of the inflow and outflow of the wastewater are equivalent in the project and the baseline scenarios (i.e. the project and baseline systems have the same efficiency for COD removal for wastewater treatment), then the higher energy consumption and sludge generation in the baseline scenario are the only significant differences contributing to emissions reductions in the project case. In this case, the emission reductions can be calculated as the difference between the historical energy consumption of the replaced unit and the recorded energy consumption of the new system, plus the difference in emissions from sludge treatment and/or disposal. Project emissions from fugitive emissions and incomplete flaring ($PE_{fugitive,y}$, $PE_{flaring,y}$) shall also be considered in the calculation of the emission reductions, however the emissions from the wastewater outflow and sludge ($PE_{ww,discharge,y}$, $PE_{s,final,y}$) may be disregarded, if they are equivalent in the baseline and project scenarios.

Methodological choices for the emission reduction calculation for scenario E

Below are the methodological choices used for calculating emission reductions baseline and monitoring methodology AMS-I.D “Grid connected renewable electricity generation” (version 17).

Baseline emissions (AMS.I.D)

52 Biogas volume and methane content measurements shall be on the same basis (wet or dry).

The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor. The emission factor can be calculated in a transparent and conservative manner as follows:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system";

OR

(b) The weighted average emissions (in t CO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Option 1: Emission factor based on the Combined Margin
If sufficient data is available, option (a) is selected which uses a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system" version 02.2.1.

Option 2: Emission factor based on the weighted average emissions
Due to the specific topography of Indonesia that involves thousands of islands and numerous discrete grids, it may not be possible to calculate the CM emission factor for every CPA because of a lack of data. In such cases the PPs will refer to the use of option (b) where the emission factor can be calculated in a transparent and conservative manner as the weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Emission reduction calculation for scenario E
Below are the methodological choices used for calculating emission reductions baseline and monitoring methodology AMS-I.D "Grid connected renewable electricity generation" (version 17).

The emission reduction calculations below need to be completed for CPA that comply with technology scenario E (Utilization of biogas for grid connected power generation). If this scenario is not applicable, then $BE_{grid,y}$ = 0 t CO_2

Baseline emissions (AMS.I.D)
The baseline emissions ($BE_{grid,y}$) are the product of the baseline emissions factor calculated above times the net electricity supplied by the project activity to the national grid ($EG_{BL,y}$), as per the formula given below:

$$BE_{grid,y} = EG_{BL,y} * EF_{CO_2,grid,y}$$ **Equation (1) of AMS.I.D Version 17**

Where:

$BE_{grid,y}$	Baseline Emissions for electicity generation from biogas that is exported to the grid in year *y* (t $CO_{2)}$
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$	CO_2 emission factor of the grid in year *y* (t CO_2/MWh)

Project Emission ($PE_{grid,y}$) (AMS.I.D)

The renewable electricity generation does not result in project emissions, since the combustion of recovered methane for electricity generation is considered as CO_2-neutral. The project emissions solely involve emissions from methane recovery in wastewater system.

Therefore: $PE_{grid,y} = 0\ tCO_2e$

Leakage

If the equipment is transferred from another activity, leakage effects at site of the other activity to be considered and estimated.

Project activities under PoA

In case project activity involves replacement of equipment, the leakage effect of the use of replaced equipment in another activity will be neglected because an independent monitoring of scrapping of replaced equipment will be conducted. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.

Emission Reduction (AMS.I.D)

Emission reduction is calculated as a difference between baseline emission and sum of project emissions and leakages. Emission reductions are calculated as follows:

$$ER_{grid,y} = BE_{grid.y} - PE_{grid,y} - LE_{grid,y}$$ **Equation (10) of AMS.I.D Version 17**

Where:

$ER_{grid,y}$	Emission reductions in year *y* (t CO_2/y)
$BE_{grid,y}$	Baseline Emissions in year *y* (t CO_2/y)
$PE_{grid,y}$	Project emissions in year *y* (t CO_2/y)
$LE_{grid,y}$	Leakage emissions in year *y* (t CO_2/y)

D.6.2. Data and parameters that are to be reported ex-ante

Data / Parameter	$EF_{CO2,grid,y}$
Unit	tCO_2e/MWh
Description	Amount of carbon dioxide emitted per Mega Watt hour electricity generated
Source of data	As stipulated by Indonesian DNA or per approach defined in section E.6.1 of the PoA-DD
Value(s) applied	To be specified for each CPA
Choice of data or Measurement methods and procedures	To be specified for each CPA
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$\mathbf{MCF_{ww,treatment,BL,i}}$
Unit	-
Description	Methane correction factor for baseline wastewater treatment system *i*
Source of data	Table III.H.1 of AMS-III.H (version 16)
Value(s) applied	Will be based on type of the wastewater treatment system in the baseline scenario of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$B_{o,ww}$
Unit	kg CH_4/kg COD
Description	Methane producing capacity of the wastewater
Source of data	Paragraph 20 of AMS-III.H (version 16)
Value(s) applied	0.25
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	UF_{BL}
Unit	-
Description	Model correction uncertainty factor to account for model uncertainties
Source of data	AMS-III.H (version 16) paragraph 20
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	-

Data / Parameter	GWP_{CH4}
Unit	-
Description	Global warming potential of methane
Source of data	IPCC value as in AMS-III.H (version 16) paragraph 20
Value(s) applied	21
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the baseline emission. The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	DOC_s
Unit	-
Description	Degradable organic content of the untreated sludge generated in the year *y* (fraction, dry basis).
Source of data	Default value as per paragraph 22 of AMS-III.H version 16
Value(s) applied	Wet basis: 0.09 Dry basis: 0.257
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology. The wastewater considered in this PoA is industrial wastewater.
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	DOC_F
Unit	-
Description	Fraction of DOC dissimilated to biogas
Source of data	IPCC default value as per paragraph 22 of AMS-III.H version 16
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission. The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	F
Unit	-
Description	Fraction of CH_4 in biogas
Source of data	IPCC default value as per paragraph 22 of AMS-III.H version 16
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission. The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter

	will not be monitored for this particular CPA.]

Data / Parameter	**$MCF_{ww,BL,discharge}$**
Unit	**-**
Description	Methane correction factor based on the discharge pathway in the baseline situation (e.g. into sea, river or lake) of the wastewater
Source of data	Values from Table III.H.1 of AMS-III.H version 16
Value(s) applied	Will be based on type of the discharge pathway in the baseline wastewater treatment system of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$COD_{ww,discharge,BL,y}$**
Unit	t/m^3
Description	Chemical oxygen demand of treated wastewater discharged into sea, river or lake
Source of data	To be determined in accordance with paragraph 26, 27 or 28 of the baseline and monitoring methodology.
Value(s) applied	To be determined based on nature of CPA.
Choice of data or Measurement methods and procedures	[Where values are based on measurement, include a description of the measurement methods and procedures applied (e.g. which standards have been used), indicate the responsible person/entity that undertook the measurement, the date of the measurement and the measurement results. This information shall be indicated at CPA level for each specific CPA]
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$MCF_{s,BL,final}$**
Unit	-
Description	Methane correction factor of the disposal site that receives the final sludge in the baseline situation.
Source of data	Estimated as per procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Value(s) applied	Will be based on type of sludge disposal site in the baseline scenario of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$\eta_{COD,BL,i}$**
Unit	%
Description	COD removal efficiency of the baseline treatment system *i*.
Source of data	To be determined in accordance with paragraph 26, 27 or 28 of the baseline and monitoring methodology.
Value(s) applied	To be determined for each CPA
Choice of data or Measurement methods and procedures	[Where values are based on measurement, include a description of the measurement methods and procedures applied (e.g. which standards have been used), indicate the responsible person/entity that undertook the measurement, the date of the measurement and the measurement results. This information shall be indicated at CPA level for each specific CPA]
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$S_{final,BL,y}$**
Unit	t
Description	Amount of dry matter in the sludge
Source of data	Measurement by CPA implementer
Value(s) applied	To be determined for each CPA
Choice of data or Measurement methods and procedures	To be determined for each CPA
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**DF**
Unit	-
Description	10-day measurement campaign factor to account for the uncertainty range (30% to 50%)
Source of data	As per AMS-III.H (version 16) paragraph 27
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline monitoring methodology
Purpose of data	The data is used to estimate the baseline emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$MCF_{ww,treatment\ PJ,k}$**
Unit	-
Description	Methane correction factor for project wastewater treatment system *k*
Source of data	Table III.H.1 of AMS-III.H version 16 or Table 6.8 of Volume 5 Chapter 6 IPCC 2006 Guideline
Value(s) applied	Will be based on type of wastewater treatment of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$MCF_{ww,treatment\ PJ,i}$
Unit	-
Description	Methane correction factor for project wastewater treatment systems i
Source of data	Table III.H.1 of AMS-III.H version 16 or Table 6.8 of Volume 5 Chapter 6 IPCC 2006 Guideline
Value(s) applied	Will be based on type of wastewater treatment of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	UF_{PJ}
Unit	-
Description	Model correction to account for model uncertainties
Source of data	AMS-III.H (version 16) paragraph 29
Value(s) applied	1.12
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$MCF_{ww,PJ,discharge}$**
Unit	-
Description	Methane correction factor based on the discharge pathway of the wastewater in the project scenario (e.g. into sea, river or lake)
Source of data	Table III.H.1. of AMS-III.H version 16
Value(s) applied	Will be based on the discharge pathway of wastewater treatment system of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	

Data / Parameter	**$MCF_{s,PJ,final}$**
Unit	-
Description	Methane correction factor of disposal site that receives the final sludge in the project situation.
Source of data	Estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"
Value(s) applied	Will be based on the sludge disposal site in the project scenario of each CPA
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline and monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**CFE_{ww}**
Unit	-
Description	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems
Source of data	Default value as per paragraph 30 of AMS-III.H version 16
Value(s) applied	0.9
Choice of data or Measurement methods and procedures	In line with the requirement of the baseline monitoring methodology
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$\eta_{COD,PJ,j}$**
Unit	%
Description	COD removal efficiency of the project treatment system *j*.
Source of data	The COD removal efficiency is obtained from the supplier of the technology.
Value(s) applied	Will be based on the technology installed in the CPA
Choice of data or Measurement methods and procedures	[Where values are based on measurement, include a description of the measurement methods and procedures applied (e.g. which standards have been used), indicate the responsible person/entity that undertook the measurement, the date of the measurement and the measurement results. This information shall be indicated at CPA level for each specific CPA]
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$\rho_{CH4,n,h}$
Unit	kg/m3
Description	Density of methane at normal conditions
Source of data	“Tool to determine project emissions from flaring gases containing methane”
Value(s) applied	0.716
Choice of data or Measurement methods and procedures	default value from the “Tool to determine project emissions from flaring gases containing methane” is applied. Stated on page 12 of the Tool.
Purpose of data	The data is used to estimate the project emission.
Additional comment	[REMOVE IF NOT APPLICABLE: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

D.6.3. Ex-ante calculations of emission reductions

>>

Emission reductions (ER_y)

Total emission reductions of the CPA will be calculated as a sum of emission reductions from methane recovery in wastewater treatment (technology scenario 1 and 2) and optionally emission reduction obtained through combustion of recovered methane for electricity generation (scenario E).

Emission reductions are calculated as follows:

$ER_y = ER_{grid,y} + ER_{methane,y}$

Where:

ER_y = Total emission reductions of the project in year y (tCO_2e/year)

$ER_{grid,y}$ = Emission reductions from electricity generation in year y (tCO_2e/year)

$ER_{methane,y}$ = Emission reductions from methane recovery in wastewater treatment in year y (tCO_2e/year)

Below are the methodological choices used for calculating emission reductions baseline and monitoring methodology AMS-III.H "Methane Recovery in Wastewater Treatment" (version 16).

Baseline emissions (AMS-III.H)

This section provides methodological choices for all baseline emission sources. Depending on the selected choices baseline in the table below, relevant equations and monitoring parameters shall be selected. In case an emission source has been excluded, the respective calculations need not to be completed.

Baseline emissions are calculated as follows:

$$BE_{methane,y} = \{BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,dischage,y} + BE_{s,final,y}\}$$

Eq. (1) of AMS-III.H Version 16

Where:

Provide explanation in case the emission source is excluded and indicate respective emissions as 0.

Included?	Parameter	Explanation	Value	Unit
	$BE_{methane,y}$	Baseline emissions from methane recovery in wastewater treatment in year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year *y*.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year *y*. Provide explanation in case the emission source is excluded.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$BE_{ww,dischage,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year *y*. Provide explanation in case the emission source is excluded.	[Value]	tCO_2e/yr

☐ Yes ☐ NO	$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year *y*. Provide explanation in case the emission source is excluded.	[Value]	tCO_2e/yr

i. Emissions on account of electricity or fossil fuel used ($BE_{power,y}$);

[In case this baseline source is excluded/disregarded: Therefore: **$BE_{power,y}$** = 0 tCO_2e]

[In case this baseline source is included: The emissions are calculated according to the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO 2 emissions from fossil fuel combustion" as follows: $BE_{power,y}$ will be determined as per procedures described in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". In case emissions due to the usage of electricity in the baseline are claimed:

$BE_{power,y}$ will be determined as per procedures described in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". $BE_{power,y} = BE_{EC,y}$

$$BE_{EC,y} = \sum_j EC_{BE,k,y} \times EF_{EL,k,y} \times \left(1 + TDL_{k,y}\right)$$ **Eq. 1 of the Tool**[53]

Where:

Parameter	Description	Value	Unit
$BE_{EC,y}$	Project emissions from electricity consumption in year y	[Value]	tCO_2e/yr
$EC_{BE,k,y}$	Quantity of electricity consumed by the project electricity consumption source k in year y	[Value]	MWh/yr
$EF_{EL,k,y}$	Emission factor for electricity generation for source k in year y	[Value]	(tCO_2/MWh)
$TDL_{k,y}$	Average technical transmission and distribution losses for providing electricity to source k in year y	[Value]	%

Description of the determination for the emission factor $EF_{EL,k,y}$ and for the Average technical transmission and distribution losses for providing electricity to source j in year y($TDL_{k,y}$), CPAs of the PoA shall consider the default value as mentioned in the tool and provide justification here.

ii. Methane emissions from baseline wastewater treatment systems ($BE_{ww,treatment,y}$);

Methane emissions from the baseline wastewater treatment systems affected by the project ($BE_{ww,treatment,y}$) are determined using the COD removal efficiency of the baseline plant. The baseline for the CPA is [description of the baseline. As such baseline emissions are calculated as follows:

[53] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

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

Eq. (2) of AMS-III.H Version 16

Where:

Parameter	Description	Value	Unit
$BE_{ww,treatment,y}$	Methane emissions from baseline wastewater treatment systems	[Value]	tCO_2e/yr
$Q_{ww,i,y}$	Volume of wastewater treated in baseline wastewater treatment system *i* in year *y*.	[Value]	m^3
$COD_{inf\,low,i,y}$	Chemical oxygen demand of the wastewater inflow to the baseline treatment system *i* in year *y*.	[Value]	t/m^3
$\eta_{COD,BL,i}$	COD removal efficiency of the baseline treatment system *i*,	[Value]	%
$MCF_{ww,treatment,BL,i}$	Methane correction factor for baseline wastewater treatment systems *i*	[Value]	-
i	Index for baseline wastewater treatment system	-	-
$B_{o,ww}$	Methane producing capacity of the wastewater	0.25	$kgCH_4/kg$ COD
UF_{BL}	Model correction factor to account for model uncertainties	0.89	-
GWP_{CH4}	Global Warming Potential for methane	21	tCO_2e/tCH_4

Please refer to section B.6.1 how to determine the CODin and CODout for the appropriate project scenario's

iii. Methane emissions from baseline sludge treatment systems ($BE_{s,treatment,y}$);

Methane emissions from the baseline sludge treatment systems affected by the project activity are determined using the methane generation potential of the sludge treatment systems:

[In case this baseline source is excluded/disregarded: Therefore: $BE_{s,treatment,y}$ = 0 tCO_2e]

iv. Methane emissions on account of inefficiencies in the baseline wastewater treatment systems and presence of degradable organic carbon in the treated wastewater discharged into river/lake/sea ($BE_{ww,discharge,y}$);

Methane emissions from degradable organic carbon in treated wastewater discharged in e.g. a river, sea or lake in the baseline situation are determined as follows:

$$BE_{ww,discharge,y} = Q_{ww,y} * GWP_{CH4} * B_{o,ww} * UF_{BL} * COD_{ww,discharge,BL,y} * MCF_{ww,BL,discharge}$$

Eq. (6) of AMS-III.H Version 16

Where:

Parameter	Description	Value	Unit
$BE_{ww,discharge,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity	[Value]	tCO_2e/yr
$Q_{ww,y}$	Volume of treated wastewater discharged in year *y*	[Value]	m^3
GWP_{CH4}	Global Warming Potential of methane	0.21	tCO_2e/tCH_4
$Bo_{,WW}$	Methane producing capacity of the wastewater	0.25	$kgCH_4/kg$ COD
UF_{BL}	Model correction factor to account for model uncertainties	0.89	-
$COD_{ww,discharge,BL,y}$	Chemical oxygen demand of the treated wastewater discharged into sea, river or lake in the baseline situation in the year *y*	[Value]	t/m^3
$MCF_{ww,BL,discharge}$	Methane correction factor based on discharge pathway in the baseline situation (e.g. into sea, river or lake) of the wastewater	[Value]	-

To determine $COD_{ww,discharge,BL,y}$: if the baseline treatment system(s) is different from the treatment system(s) in the project scenario, the monitored values of the COD inflow during crediting period will be used to calculate the baseline emissions *ex post*. The outflow COD of the baseline systems will be estimated using the removal efficiency of the baseline treatment systems, estimated as per paragraphs 26, 27 or 28 of AMS.III.H. A description of this will be provided here and if applicable also in annex 3 of the CPA-DD.

v. Methane emissions from the decay of the final sludge generated by the baseline treatment systems ($BE_{s,final,y}$).

Methane emissions from anaerobic decay of the final sludge produced are determined as follows:

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

Eq. (7) of AMS-III.H Version 16

Where:

Parameter	Description	Value	Unit
$BE_{s,final,y}$	Methane emissions from the decay of the final sludge generated by the baseline treatment systems	[Value]	tCO_2e/yr
$S_{final,BL,y}$	Amount of dry matter in the final sludge generated by the baseline wastewater treatment systems in the year *y* (t).	[Value]	t
$MCF_{s,BL,final}$	Methane correction factor of the disposal site that receives the final sludge in the baseline situation, estimated as per the procedures described in the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"	[Value]	-
UF_{BL}	Model correction factor to account for model uncertainties	0.89	-
DOC_F	Fraction of DOC dissimulated to biogas	0.5	tCH_4/t DOC

F	Fraction of CH4 in biogas	0.5	-
GWP_{CH4}	Global Warming Potential of methane	21	tCO_2e/tCH_4

If the baseline wastewater treatment system is different from the treatment system in the project scenario, the sludge generation rate (amount of sludge generated per unit of COD removed) in the baseline may differ significantly from that of the project scenario. For example, it is known that the amount of sludge generated in aerobic wastewater systems is larger than in anaerobic systems, for the same COD removal efficiency. Therefore, for these cases, the monitored values of the amount of sludge generated during the crediting period will be used to estimate the amount of sludge generated in the baseline, as follows:

$$S_{j,BL,y} = S_{l,PJ,y} * \frac{SGR_{BL}}{SGR_{PJ}}$$ **Eq. (5) of AMS-III.H Version 16**

Parameter	Description	Value	Unit
$S_{j,BL,y}$	Baseline quantity of dry matter in sludge	[Value]	t dry matter
$S_{l,PJ,y}$	Project quantity of dry matter in sludge	[Value]	t dry matter
SGR_{BL}	Sludge generation ratio of the wastewater treatment plant in the baseline scenario	[Value]	t of dry matter/t COD removed
SGR_{PJ}	Sludge generation ratio of the wastewater treatment plant in the project scenario	[Value]	t of dry matter/t COD removed

Project Activity Emissions (AMS-III.H)

The project emissions are calculated using the following equations:

$$PE_{methane,y} = \left\{ \begin{matrix} PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + \\ PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y} \end{matrix} \right\}$$ **Eq. (8) of AMS-III.H Version 16**

Where:

Included?	Parameter	Description	Value	Unit
	$PE_{methane,y}$	Project activity emissions from methane recovery in wastewater treatment in the year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{power,y}$	Emissions from electricity or fuel consumption in the year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{ww,treatment,y}$	Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{s,treatment,y}$	Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery, in year *y*.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{ww,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater in year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge produced in year *y*.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year *y*	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year *y*.	[Value]	tCO_2e/yr
☐ Yes ☐ NO	$PE_{biomass,y}$	Methane emissions from biomass stored under anaerobic conditions	[Value]	tCO_2e/yr

Provide an explanation if certain emission sources are not included.

vi. CO_2 emissions from electricity and fuel used by the project facilities ($PE_{power,y}$);

$PE_{power,y}$ Emissions from electricity or fuel consumption in the year *y* (tCO_2e). These emissions will be calculated as per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".

A typical CPA of the PoA will consume electricity at the project site to run various equipment. The emission on the account of electricity ($PE_{power,y} = PE_{EC,y}$)consumption has been designed to calculate in accordance with the "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01).

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times \left(1 + TDL_{j,y}\right)$$ **Eq. 1 of the Tool**[54]

Where:

Parameter	Description	Value	Unit
$PE_{EC,y}$	Project emissions from electricity consumption in year y	[Value]	tCO_2e/yr
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y	[Value]	MWh/yr
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y	[Value]	tCO_2/MWh

[54] Equation numbering maintained as shown in "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (version 01)

$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y	[Value]	-

In case electricity is generated with biogas:

PE $_{power,y}$ = 0 tCO_2e

Description of the determination for the emission factor $EF_{EL,j,y}$ and for the Average technical transmission and distribution losses for providing electricity to source j in year y(TDL_{jy}), CPAs of the PoA shall consider the default value as mentioned in the tool and provide justification here.

Fossil fuel consumption

Since fossil fuel (diesel, coal or FO) may be CO_2 emission from fossil fuel combustion ($PE_{FC,y}$) should be calculated using the latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" Version 02 (EB 41, Annex 11). According to this Tool, 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:

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad (1)^{55}$$

Where

Parameter	Description	Value	Unit
$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during year *y*	[Value]	(t CO_2e/yr)
$FC_{i,j,y}$	Is the quantity of fuel type *i* combusted in process *j* during year *y*	[Value]	(mass or volume unit/year)
$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *j*	[Value]	(t CO_2/mass or volume unit)
i	Are the fuel types combusted in process *j* during the year *y*	[Value]	

Table E.6.2.4

As the data on the chemical composition of the fossil fuel type *i* used by the project activity is not available. Thus, the option B of the Tool is adopted for calculation of the CO_2 emission coefficient $COEF_{i,y}$. The $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i* , as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

(4)**Error! Bookmark not defined.**

Where:

Parameter	Description	Value	Unit
$COEF_{i,y}$	Is the CO_2 coefficient of fuel type *i* in year *y*	[Value]	(t CO_2/mass or volume unit)
$NCV_{i,y}$	Is the weighted average net calorific value of the fuel	[Value]	(GJ/mass or

[55] Tool to calculate project or leakage CO2 emissions from fossil fuel combustion

	type *i* in year *y*		volume unit)
$EF_{CO2,i,y}$	Is the weighted average CO_2 emission factor of fuel type *i* in year *y*	[Value]	(t CO_2/GJ)
i	Are the fuel types combusted in process *j* during the year *y*	[Value]	Type

Table E.6.2.5

Fossil fuel consumption will be estimated ex-ante based on parameters available in the feasibility study report or a declaration from the technology supplier of each CPA. Actual fossil fuel consumption will be part of the monitoring plan of each CPA.

vii. Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery in the project scenario ($PE_{ww,treatment,y}$);

As described above the project activity affects systems of the baseline wastewater treatment plant. This thus is thus irrelevant. For these the project emissions are calculated as:

$$PE_{ww,treatment,y} = \sum_i (Q_{ww,k,y} * COD_{inflow,k,y} * \eta_{PJ,i} * MCF_{ww,treatment,PE,i}) * B_{o,ww} * UF_{BL} * GWP_{CH4}$$

Parameter	Description	Value	Unit
$PE_{ww,treatment,y}$	Project emissions of the wastewater treatment systems affected by the project activity	[Value]	tCO_2e/yr
$Q_{ww,k,y}$	Volume of wastewater treated in the project wastewater treatment system *k*	[Value]	t
$COD_{inflow,k,y}$	Chemical oxygen demand of the wastewater inflow to the baseline treatment system *k*	-	-
$\eta_{,PJ,k,}$	COD removal efficiency of the project treatment system *i*	[Value]	t/m^3
$MCF_{ww,treatment,PJ,i}$	Methane correction factor for project wastewater treatment systems *i*	[Value]	kg CH4/kg COD
$B_{0,ww}$	Methane producing capacity of the wastewater	0.25	
UF_{PJ}	Model correction factor to account for model uncertainties	0.89	-
GWP_{CH4}	Global warming potential of methane	21	tCO_2e/tCH_4

viii. Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery in the project situation ($PE_{s,treatment,y}$);

The project activity affects systems of the baseline wastewater treatment plant as described above. This thus is thus irrelevant. For these the baseline emissions are calculated as:

$$PE_{s,treatment,y} = \sum S_{l,PJ,y} \cdot MCF_{s,treatment,l} \cdot DOC_s \cdot UF_{PJ} \cdot DOC_F \cdot F \cdot 16/12 \cdot GWP_{CH4}$$

Parameter	Descrip	Value	Unit
$PE_{s,treatment,y}$	Project emissions of the sludge treatment systems affected by the project activity	[Value]	tCO_2e

$S_{l,PJ,y}$	Amount of dry matter in the sludge treated by the sludge treatment system *l*	[Value]	t
$MCF_{s,treatment,l}$	Methane correction factor for sludge treatment	[Value]	t/m^3
DOC_s	Degradable organic content of the untreated sludge generated in the year *y* (fraction, dry	[0.5 or 0.257]	-
UF_{PJ}	Model correction factor	1.12	-
DOC_F	Fraction of DOC dissimulated to biogas	0.	-
F	Fraction of CH4 in biogas	0.	-
GWP_{CH4}	Global Warming Potential of methane	2	tCO_2e/tCH_4

ix. Methane emissions on account of inefficiency of the project activity wastewater treatment systems and presence of degradable organic carbon in treated wastewater ($PE_{ww,discharge,y}$);

Project emissions on account of inefficiency of the project wastewater treatment system are only relevant for those systems that are affected by the project activity and that discharge treated wastewater. The calculation of emissions from this source is as follows:

$$PE_{ww,discharge,y} = Q_{ww,y} \cdot GWP_{CH4} \cdot B_{0,ww} \cdot UF_{PJ} \cdot COD_{ww,discharge,PJ,y} \cdot MCF_{ww,PJ,discharge}$$

[In case there is no system affected by the PA that discharges wastewater: The proposed activity does not affect a system of the wastewater plant that discharges wastewater to the project activity. This thus is thus irrelevant.

Parameter	Descri	Value	Unit
$PE_{ww,discharge,y}$	Project emissions from wastewater discharge	[Value]	tCO_2e
$Q_{ww,y}$	Volume of treated wastewater discharged	[Value]	m^3
GWP_{CH4}	Global Warming Potential of methane	21	tCO_2e/tCH_4
$Bo,_{WW}$	Methane producing capacity of the wastewater	0.25	kg CH4/kg COD
UF_{PJ}	Model correction factor	1.12	-
$COD_{ww,discharge,PJ,y}$	Chemical oxygen demand of the treated wastewater discharged into	[Value]	t/m^3
$MCF_{ww,PJ,discharge}$	Methane correction factor based on the discharge pathway	[Value]	-

x. Methane emissions from the decay of the final sludge generated by the project activity treatment systems ($PE_{s,final,y}$);

[Keep if applicable, else delete: The project activity will generate final sludge. However, for the generated final sludge aerobic storage conditions will be ensured. This can be ensured by {Describe how aerobic conditions for decay of final sludge will be ensured}.]
[Keep if applicable, else delete: The project activity will generate final sludge. However, the quantities and the properties of final sludge are the same in the baseline and the project scenario. Therefore, this source is zero.]

[Delete if any of the above two statements was applicable: “Final sludge” is produced by the wastewater treatment plant. Project emissions from this source are calculated as follows:

$$PE_{s,final,y} = S_{final,PJ,y} \cdot DOC_s \cdot UF_{PJ} \cdot MCF_{s,PJ,final} \cdot DOC_F \cdot F \cdot 16/12 \cdot GWP_{CH4}$$

Parameter	Description	Value	Unit
$PE_{s,final,y}$	Project emissions from treatment of final sludge	[Value]	tCO_2e
$S_{final,PJ,y}$	Amount of dry matter in the final sludge	[Value]	t
DOC_s	Degradable organic content of the sludge generated (fraction, dry basis)	[0.5 or 0.257]	-
UF_{PJ}	Model correction factor	1.12	-
$MCF_{s,BL,final}$	Methane correction factor for disposal site of final sludge	[Value]	-
DOC_F	Fraction of DOC dissimulated to biogas	0.5	tCH_4/t DOC
F	Fraction of CH4 in biogas	0.5	-
GWP_{CH4}	Global Warming Potential of methane	21	tCO_2e/tCH_4

xi. Methane fugitive emissions due to inefficiencies in capture systems ($PE_{fugitive,y}$);

Project activity emissions from methane release in capture systems are determined as follows: This emission source is relevant to any project scenario as it applies to any installed biogas digester generating biogas. The calculation of this emission source is as follows:

$$PE_{fugitive,y} = 0.05 \cdot BG_{bumt,y}$$

For the ex-ante emission calculation the following formula will be applied:

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

Parameter	Description	Value	Unit
$PE_{fugitive,y}$	Fugitive emissions through capture inefficiencies	[Value]	tCO_2e
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems	[Value]	tCO_2e
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems	[Value]	tCO_2e

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

Parameter	Description	Value	Unit
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems	[Value]	tCO_2e
CFE_{ww}	Capture efficiency of the biogas recovery equipment in the wastewater treatment systems	0.9	-
$MEP_{ww,treatment,y}$	Methane emission potential of wastewater treatment systems equipped with biogas recovery system	[Value]	t

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

Parameter	Description	Value	Unit
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems	[Value]	tCO_2e
CFE_{ww}	Capture efficiency of the biogas recovery equipment	0.9	-

	in the wastewater treatment systems		
$MEP_{ww,treatment,y}$	Methane emission potential of wastewater treatment systems equipped with biogas recovery system	[Value]	t
UF_{PJ}	Model correction factor	1.12	-
$MCF_{ww,treatment,PJ,k}$	Methane correction factor for the project wastewater treatment system *k* equipped with biogas recovery equipment	[Value]	-

In the baseline sludge treatment is not included, therefore:

$PE_{fugitive,s,y} = 0\ tCO_2e$

xii. Methane emissions due to incomplete flaring ($PE_{flaring,y}$);

$PE_{flaring,y}$ Methane emissions due to incomplete flaring. The *ex post* emission reduction will be calculated as per "Tool to determine project emissions from flaring gases containing methane" by using actual monitored data.

Methane may be released as a result of incomplete combustion in the flare. To calculate project emissions from flaring of the biogas (PE_{flare}), the "Tool to determine project emissions from flaring gases containing methane" (version 01 approved at EB28) is applied.

For determination of the flare efficiency, a default value of 50/90% will be used for the calculation of project emissions from flaring gases if the CPA uses since an open/enclosed will be employed by the CPA.

The tool specifies 7 steps for calculation.

Step 1: Determination of the mass flow rate of the residual gas that is flared

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas.

This step calculates the residual gas mass flow rate in each hour h, based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas. Alternatively, the tool provides a simplified approach to only measure the volumetric fraction of methane and to consider the deference to 100% as being nitrogen. The proposed project activity adopts this simplified approach.

Step 2 is not applicable because of the simplified approach taken where only the volumetric fraction of methane is measured.

Steps 3 & 4 are only applicable if the combustion efficiency of the flare is continuously monitored and are therefore not considered.

Step 5: Determination of methane mass flow rate in the residual gas on a dry basis

The quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions (normal conditions and dry or wet basis).

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n}$$ **Eq. 13 of Flaring Tool Version 01**

Where:

Parameter	Description	Value	Unit
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour *h*	[Value]	kg/h
$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour *h*	[Value]	m^3/h
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the residual gas on dry basis in hour *h*	[Value]	m^3/h
$\rho_{CH4,n}$	Density of methane at normal conditions	[Value]	kg/m^3

Step 6: Determination of the hourly flare efficiency

The CPA is using an open flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the flame is not detected for more than 20 minutes during the hour *h*.
- 50%, if the flare is detected for more than 20 minutes during the hour *h*.

The CPA uses an enclosed flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is:

- 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour *h* .
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h*, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour *h*.
- 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h* and the manufacturer's specifications on proper operation of the flare are met continuously during the hour *h*.

Step 7: Calculation of annual project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions from each hour *h*, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour *h* ($\rho_{flare,h}$), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1-\eta_{flare,h}) \times \frac{GWP_{CH4}}{1000}$$ **Eq. 15 of Flaring Tool Version 01**

Where:

Parameter	Description	Value	Unit

$PE_{flare,y}$	Project emissions from flaring of the residual gas stream in year *y*	[Value]	tCO_2e/yr
$TM_{RG,h}$	Mass flow rate of the methane in the residual gas in the hour *h*	[Value]	kg/h
$\eta_{flare,h}$	Flare efficiency in hour *h*	[Value]	fraction

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

Anaerobic storage of biomass due to the project activity is excluded by the formulated eligibility criteria. Thus:

$PE_{biomass,y}$ = 0 tCO_2e

Leakage (AMS-III.H)

If the technology is using equipment transferred from another facility, leakage effects at the site of the other activity are to be considered and estimated (LE_y).
Otherwise:

LE_y = 0 tCO_2e

Emission reductions ($ER_{methane,y}$) (AMS-III.H)

Emission reductions shall be estimated *ex ante* as follows:

$$ER_{methane,y,ex\,ante} = BE_{methane,y,ex\,ante} - \left(PE_{methane,y,ex\,ante} + LE_{methane,y,ex\,ante}\right)$$

Eq. (14) of AMS-III.H Version 16

Where:

Parameter	Description	Value	Unit
$ER_{methane,y,ex\,ante}$	*Ex ante* emission reduction in year *y*	[value]	tCO_2e
$LE_{methane,y,ex\,ante}$	*Ex ante* leakage emissions in year *y*	[value]	tCO_2e
$PE_{methane,y,ex\,ante}$	*Ex ante* project emissions in year *y*	[value]	tCO_2e
$BE_{methane,y,ex\,ante}$	*Ex ante* baseline emissions in year *y*	[value]	tCO_2e

Emission reduction calculation for scenario E

Below are the methodological choices used for calculating emission reductions baseline and monitoring methodology AMS-I.D "Grid connected renewable electricity generation" (version 17).

The emission reduction calculations below need to be completed for CPA that comply with technology scenario E (Utilization of biogas for grid connected power generation). If this scenario is not applicable, then $BE_{grid,y}$ = 0 t CO_2

Baseline emissions (AMS.I.D)

The baseline emissions ($BE_{grid,y}$) are the product of the baseline emissions factor calculated above times the net electricity supplied by the project activity to the national grid ($EG_{BL,y}$), as per the formula given below:

$$BE_{grid,y} = EG_{BL,y} * EF_{CO_2,grid,y}$$ **Equation (1) of AMS.I.D Version 17**

Where:

$BE_{grid,y}$	Baseline Emissions for electicity generation from biogas that is exported to the grid in year *y*	[value]	(t CO_2)
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y*	[value]	MWh
$EF_{CO2,grid,y}$	CO_2 emission factor of the grid in year *y*	[value]	t CO_2/MWh

Project Emission ($PE_{grid,y}$) (AMS.I.D)

The renewable electricity generation does not result in project emissions, since the combustion of recovered methane for electricity generation is considered as CO_2-neutral. The project emissions solely involve emissions from methane recovery in wastewater system.

Therefore: $PE_{grid,y}$ = 0 tCO_2e

Leakage ($LE_{grid,y}$) (AMS.I.D)

According to AMS.I.D version 17, if the energy generating equipment is transferred from another activity, leakage is to be considered. Otherwise, it will be neglected. This shall be taken into account in the specific CPA-DD for each CPA.

Therefore: $\mathbf{LE_{grid,y}}$ = 0 tCO_2e

Emission Reduction (AMS.I.D)

Emission reductions are calculated as follows:

$$ER_{grid,y} = BE_{grid.y} - PE_{grid,y} - LE_{grid,y}$$ **Equation (10) of AMS.I.D Version 17**

Where:

$ER_{grid,y}$	Emission reductions in year *y*	[value]	t CO_2/y
$BE_{grid,y}$	Baseline Emissions in year *y*	[value]	t CO_2/y
$PE_{grid,y}$	Project emissions in year *y*	[value]	t CO_2/y
$LE_{grid,y}$	Leakage emissions in year *y*	[value]	t CO_2/y

D.7. Application of the monitoring methodology and description of the monitoring plan

D.7.1. Data and parameters to be monitored by each generic CPA

(Copy this table for each data and parameter)

Data / Parameter	**$EG_{facility,y}$**
Unit	MWh/y
Description	Quantity of net electricity supplied to the grid in year y
Source of data	Measured by electricity meter(s) for each CPA
Value(s) applied	To be defined with respect to each CPA.
Measurement methods and procedures	Measurement method: Measurements will be undertaken using energy meters having accuracy according to manufacturer's specification. The net electricity exported/supplied to the grid is calculated as the difference between the measured quantities of the grid electricity export and the import. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Monitoring frequency: Continuous monitoring, hourly measurement and at least monthly recording.
QA/QC procedures	Cross checking/Verification: The net electricity supplied to the grid will also be cross checked from the calculation of gross energy generation in the project activity power plant minus the auxiliary/station electricity consumption, technical losses and electricity import from the grid to the project power plant. The measurement results shall be cross checked with records for sold/purchased electricity (e.g., invoices/receipts). Calibration of power meter (s) will be undertaken according to the manufacture's specification.
Purpose of data	Calculation of baseline emissions
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$Q_{ww,i,y}$
Unit	m³/month
Description	The flow of wastewater
Source of data	Onsite measurements
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measurements are undertaken using flow meters. Details e.g. location, configuration, accuracy, class of the measurement device are to be provided in the CPA-DD. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained)
QA/QC procedures	Flow meter will be calibrated prior to operation and a calibration certificate will be issued. Further calibration of the meter in accordance with relevant industry standard, local/national standards, or as per manufacturer's specifications. If local/national standards or the manufacturer's specifications are not available, international standards may be used.
Purpose of data	Calculation of baseline emissions; Calculation of project emissions;
Additional comments	At the time of the CPA inclusion, for each of the relevant wastewater flow meter separate tables shall be provided. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$COD_{ww,untreated,y}$
Unit	tCOD/m³
Description	The chemical oxygen demand of the wastewater before and after the treatment system affected by the project activity
Source of data	Representative Sampling by CPA implementer
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the COD according to national or international standards. COD is measured through representative sampling Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications. Cross-check will be performed at least every six months by accredited lab. In case accredited lab is used, the accreditation certificate will act as the proof of correct calibration and application of standard by the respective lab..
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$COD_{ww,treated,y}$**
Unit	tCOD/ m^3
Description	Chemical oxygen demand of the treated wastewater leaving the project treatment system
Source of data	Representative Sampling by CPA implementer
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the COD according to national or international standards. COD is measured through representative sampling Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications. Cross-check will be performed at least every six months by accredited lab. In case accredited lab is used, the accreditation certificate will act as the proof of correct calibration and application of standard by the respective lab.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$COD_{PJ,iuflow,k}$
Unit	tCOD/ m^3
Description	Chemical oxygen demand of the untreated wastewater entering the wastewater treatment systems affected by the project activity
Source of data	Representative Sampling by CPA Implementer
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the COD according to national or international standards. COD is measured through representative sampling. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications. Cross-check will be performed at least every six months by accredited lab. In case accredited lab is used, the acredition certificate will act as the proof of correct calibration and application of standard by the respective lab.
Purpose of data	Calculation of project emissions;
Additional comments	This may be applicable, for instance, where the baseline scenario is the use of open anaerobic lagoons and the project scenario is introduction of anaerobic digester prior to the existing open anaerobic ponds (i.e. without replacing the existing open anaerobic lagoons). The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$COD_{PJ,outflow,k}$
Unit	tCOD/ m^3
Description	Chemical oxygen demand of the treated wastewater leaving the wastewater treatment systems affected by the project activity and not equipped with biogas recovery in year y
Source of data	Representative Sampling by CPA Implementer
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the COD according to national or international standards. COD is measured through representative sampling. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications. Cross-check will be performed at least every six months by accredited lab. In case accredited lab is used, the accreditation certificate will act as the proof of correct calibration and application of standard by the respective lab..
Purpose of data	Calculation of project emissions;
Additional comments	This may be applicable, for instance, where the baseline scenario is the use of open anaerobic lagoons and the project scenario is introduction of anaerobic digester prior to the existing open anaerobic ponds (i.e. without replacing the existing open anaerobic lagoons). The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$COD_{ww,discharge,y}$**
Unit	tCOD/ m^3
Description	Chemical oxygen demand of the treated wastewater discharged to river/water/lake.
Source of data	Representative Sampling by CPA Implementer
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the COD according to relevant standards. COD is measured through representative sampling. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications. Cross-check will be performed at least every six months by accredited lab. In case accredited lab is used, the accreditation certificate will act as the proof of correct calibration and application of standard by the respective lab..
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$S_{final,PJ,y}$
Unit	t
Description	Amount of dry matter in final sludge
Source of data	Onsite measurements
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Measure the total quantity of sludge on a wet basis. The volume (m^3) and density or direct weighing may 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 Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Monitoring of 100% of the sludge amount through continuous or batch measurements and moisture content through representative sampling to ensure the 90/10 confidence/precision level.
QA/QC procedures	Average value will be used through sampling with 90/10 confidence/precision level. Calibration of the equipment used will also be conducted as per manufacturer specifications in case the weighbridge is available onsite. If a third party weight bridge is used, calibration certificate shall be requested from weight bridge owner.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$BG_{burnt,y}$
Unit	m^3
Description	Annual volume of biogas combusted in year *y*
Source of data	Measured using continuous flow meters.
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	In all cases, the amount of biogas recovered, fuelled, flared or otherwise utilized shall be measured using continuous flow meters. If the biogas streams flared and fuelled (or utilized) are monitored separately, the two fractions can be added together to determine the total biogas recovered, without the need to monitor the recovered biogas before separation. The methane content measurement shall be carried out close to the biogas flow meters. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained)
QA/QC procedures	The measurement will be monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 will be attained). Meters will be calibrated as per vendor's specifications
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$\eta_{flare,h}$
Unit	%
Description	Flare efficiency in year *y* (fraction).
Source of data	Project Entity
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	As per the "Tool to determine project emissions from flaring gases containing Methane". Regular maintenance shall be carried out to ensure optimal operation of flares. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Continuously.
QA/QC procedures	As per the "Tool to determine project emissions from flaring gases containing methane". Maintenance and calibration as per manufacturer's specifications
Purpose of data	Calculation of project emissions;
Additional comments	In case the project uses an open flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is: • 0% if the flame is not detected for more than 20 minutes during the hour *h*. • 50%, if the flare is detected for more than 20 minutes during the hour *h*. In case the project uses an enclosed flare, the flare efficiency in the hour h ($\eta_{flare,h}$) according to the tool is: • 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour *h* . • 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h*, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour *h*. • 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour *h* and the manufacturer's specifications on proper operation of the flare are met continuously during the hour *h*. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$w_{CH4,y}$
Unit	%
Description	Methane content in biogas in year *y*
Source of data	Details e.g. location, configuration, accuracy, class of the measurement device are to be provided in the CPA-DD.
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	The fraction of methane in the gas will be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level. 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 shall be carried out close to a location in the system where a biogas flow measurement takes place. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	The fraction of methane in the gas should be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level.
QA/QC procedures	The measurement will be monitored regularly and the analyser used will be calibrated periodically as per vendor's specifications.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**T**
Unit	^{o}C
Description	Temperature of the biogas recovered
Source of data	Measurements from the temperature indicator
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	The temperature of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures	Calibration of the meter will be as per vendor's specifications.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	P
Unit	Pa
Description	Pressure of the biogas
Source of data	Pressure measurement device
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	The pressure of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures	Calibration of the meter will be as per vendor's specifications.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$fv_{i,h}$**
Unit	-
Description	Volumetric fraction of component i in the residual gas in the hour h where i = CH4 , CO, CO2 , O2 ,H2 , N2
Source of data	Measurements by project participants using a continuous gas analyser
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	Ensure that the same basis (dry or wet) is considered for this measurement and the measurement of the volumetric flow rate of the residual gas (FV RG,h) when the residual gas temperature exceeds 60 ºC Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Continuously. Values to be averaged hourly or at a shorter time interval
QA/QC procedures	Analysers must be periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard certified gas.
Purpose of data	Calculation of project emissions;
Additional comments	As a simplified approach, project participants may only measure the methane content of the residual gas and consider the remaining part as N_2. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$FV_{RG,h}$
Unit	m^3/h
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour h
Source of data	Measurements by project participants using a flow meter
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	Ensure that the same basis (dry or wet) is considered for this measurement and the measurement of volumetric fraction of all components in the residual gas ($fv_{i,h}$) when the residual gas temperature exceeds 60 ºC. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Continuously. Values to be averaged hourly or at a shorter time interval
QA/QC procedures	Flow meters are to be periodically calibrated according to the manufacturer's recommendation.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**T_{flare}**
Unit	°C
Description	Temperature in the exhaust gas of the flare
Source of data	Measurements by project participants
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. A temperature above 500 ºC indicates that a significant amount of gases are still being burnt and that the flare is operating. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Continuously.
QA/QC procedures	Thermocouples should be replaced or calibrated every year.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**Other flare operation parameters**
Unit	-
Description	This should include 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.
Source of data	Measurements by project participants
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	To be defined for each CPA at time of inclusion Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	Continuously
QA/QC procedures	To be defined for each CPA at time of inclusion
Purpose of data	Calculation of project emissions;
Additional comments	Create copies of this table as required to indicate more parameters. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later.

	[REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$TDL_{j,y}$; $TDL_{k,y}$**
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to source *j/k* in year *y*
Source of data	As per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 01 (EB 39 annex 7).
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	As per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 01 (EB 39 annex 7). Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	----
QA/QC procedures	----
Purpose of data	Calculation of project emissions; Calculation of baseline emissions;
Additional comments	At the time of the CPA inclusion, for each of the relevant TDL separate tables shall be provided. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later.

Data / Parameter	$EC_{PJ,j,y}$
Unit	MWh/yr
Description	Quantity of electricity consumed by the project consumption source *j* in the year *y*
Source of data	Electricity meters or installed capacity multiplied by 8,760 h/yr multiplied by 1.1 to account for technical transmission and distribution losses.
Value(s) applied	Specifically for each project site in the specific CPA-DD
Measurement methods and procedures	If measured: Electricity meters continuously monitor power consumption by electrical equipment within the project boundary. If based on installed capacity: Calculated based on installed capacity in MW multiplied by 8,760 h/yr plus 10% Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	To be defined for each CPA at time of inclusion
QA/QC procedures	If measured: Regular maintenance of meters according to manufacturer's Indications and calibration according to national standards.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$FC_{DIESEL,i,y}$; $FC_{FO,i,y}$; $FC_{COAL,i,y}$**
Unit	Mass or volume unit per year (e.g. ton/yr or m3 /yr)
Description	Quantity of fossil fuel combusted in process j during year *y*
Source of data	On site measurement
Value(s) applied	Value to be used for ex ante CER estimation for the CPA shall be based on the data available at the time of CPA inclusion.
Measurement methods and procedures	Description of the actual measurement method using any of the three alternatives provide in the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" shall be provided at individual CPA level. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	To be defined for each CPA at time of inclusion
QA/QC procedures	To be defined for each CPA at time of inclusion
Purpose of data	Calculation of project emissions;
Additional comments	At the time of the CPA inclusion, for each of the relevant fossil fuel separate tables shall be provided. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	**$NCV_{DIESEL,y}$; $NCV_{FO,y}$; $NCV_{COAL,y}$**
Unit	GJ / ton
Description	Weighted average net calorific value of the fossil fuel consumed in year *y*
Source of data	Any of the four data source in preferential order as mentioned in the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".
Value(s) applied	To be determined with respect to each CPA at time of inclusion
Measurement methods and procedures	Any of the four data source in preferential order as mentioned in the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". For option a) and b): Measurements should be undertaken in line with national or international fuel standards. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	To be defined for each CPA at time of inclusion
QA/QC procedures	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Purpose of data	Calculation of project emissions;
Additional comments	At the time of the CPA inclusion, for each of the relevant fossil fuel separate tables shall be provided. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	$EF_{CO2,DIESEL,y}$; $EF_{CO2,FO,y}$; $EF_{CO2,COAL,y}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type *diesel; Fuel Oil; Coal* in year y
Source of data	Any of the four data source in preferential order as mentioned in the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion".
Value(s) applied	Value to be determined by each CPA at time of inclusion.
Measurement methods and procedures	Any of the four data source in preferential order as mentioned in the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". For option a) and b): Measurements should be undertaken in line with national or international fuel standards. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	To be defined for each CPA at time of inclusion
QA/QC procedures	To be defined for each CPA at time of inclusion
Purpose of data	Calculation of project emissions;
Additional comments	At the time of the CPA inclusion, for each of the relevant fossil fuel separate tables shall be provided. The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

Data / Parameter	End use of sludge
Unit	n.a.
Description	Sludge from anaerobic digesters in project scenario
Source of data	Sludge is directly applied to land or used as input for the onsite aerobic composting plant.
Value(s) applied	There are no project emissions to be taken into account, as in line with AMS.III.H.
Measurement methods and procedures	Any other usage of the sludge other than land application or composting will be monitored. Where data or parameters are to be monitored, specify the measurement methods and procedures, standards to be applied, accuracy of the measurements, person/entity responsible for the measurements, and, in case of periodic measurements, the measurement intervals;
Monitoring frequency	To be defined for each CPA at time of inclusion
QA/QC procedures	N.a.
Purpose of data	Calculation of project emissions;
Additional comments	The data will be archived electronically and kept for minimum of two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. [REMOVE IF THIS PARAMETER REQUIRES MONITORING: This table is not relevant to the project activity [because [specify reason] and can thus be ignored. The parameter will not be monitored for this particular CPA.]

D.7.2. Description of the monitoring plan for a generic CPA

>>

In order to ensure all CPAs are monitored and verified as per the applied monitoring methodology, the CME has prepared a comprehensive monitoring plan for all the CPAs to be included in the PoA. Furthermore, the CME will conduct periodical inspection of units randomly at any given time in a year. For this purpose the CME will deploy trained monitoring personnel who will visit the CPAs sites, review their records and take corrective actions if required. The monitoring personnel would duly attest the records as a mark of satisfactory inspection. The CME would randomly check the visits of monitoring personnel in order to ensure due compliance of registered monitoring plan.

Templates (as a part of monitoring manual) are made to record the data to be monitored. The monitoring personnel of the CME would be provided with such templates. In-house training shall be imparted to plant personnel (at the CPA site) for the efficient monitoring/recording of the data and to translate the same into the computation of emission reductions.

In case sampling is applied to obtain monitoring results, the relevant and latest guidance from EB in relation to sampling shall be applied.

The key considerations for developing monitoring plans in individual CPAs are discussed below.

1. Introduction

The Monitoring Plan (MP) would present a plan to meet the requirements for the collection,

processing and reporting of data. It will describe the management systems and procedures to be implemented by CME upon implementation of each CPA in order to ensure consistency between the project operation as well as monitoring, processing and reporting of data required for the calculation of emission reductions (ERs).

2. Obligations of CME

It will be the responsibility of the CME to develop and implement a management and operational system for a CPA that will meet the requirements of the MP.

3. Description of data required to be monitored

Data for each parameter will be monitored at a frequency described in the relevant table of section D.7.1. The main equipments used for monitoring are:

- Wastewater flow meters
- Steam flow meters
- Biogas flow meters
- Biogas Pressure gauge
- Biogas Temperature sensor
- Gas analyzer for measuring the methane content in biogas
- Flame detector Temperature sensor for flame monitoring
- Electricity meters
- COD laboratory test results.

The MP will identify the various data parameters to be monitored in order to calculate the emission reductions. Data parameters which need to be monitored will be recorded in the following format:

Parameter ID	Name of the Data Parameter	Data unit of the parameter

Table B.7.1.1 – description of data required for monitoring

4. Recommendations for improvisation in the monitoring plan

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

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

This section will contain a detailed description of the data collection and recording measures to be implemented for each of the data parameter which is monitored under the CPA. This section will address the following criteria for each of the monitoring data parameter:

8. Description of the primary source of data from where the information pertaining to the data parameter will be collected
9. Description of the data collection process
10. Description of the data recording process

11. Description of the measurement instruments, in case a given parameter is to be measured (for e.g. meters used for measuring energy consumption, operating hours)
12. Calibration requirement of the measurement instrument
13. Description of data storage process
14. Other information, if required

The other relevant data will be recorded by the CPA owners and would be provided on quarterly basis to the CME. The data received will be archived electronically for computations of emission reductions on annual basis. Such archived data will be kept until two years after the end of the crediting period or the issuance of CERs whichever is later. Each small scale CPA shall follow all the provision of the PoA including that related to monitoring. Only those CPA implementers who confirm to sign an agreement in this context shall be included in the PoA, as this is a part of eligibility criteria

6. Independent monitoring of scrapping of replaced equipment:

In case project activity involves replacement of equipment, and leakage effect of the use of replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified

7. Procedures for emergency preparedness for cases where emergencies cause unintended emissions:

For each CPA an emergency preparedness procedure will be developed which takes into account:

- Procedures to avoid unintended emissions during operation and maintenance
- General procedures to avoid unintended emissions due to activities near the biogas plan.
- Inspection procedures to ensure integrity of the biogas plant

8. Procedures for review of the reported results/data:

To minimize the possible errors in the process of data collection, the entry of data gathered during onsite visits by the monitoring personnel of the CME will be compared with the data submitted by CPA implementers throughout the year. The data will be reviewed by the CME and a comparison between the data sent by the CPA implementers and the data obtained during the onsite visit by the monitoring personnel shall be performed to ensure that the data are consistent and correct.

Monitoring requirements for technology scenario E (Utilization of biogas for grid connected power generation):

The monitoring plan applies to CPA that comply with technology scenario E (Utilization of biogas for grid connected power generation) and can the text can be deleted if scenario E is not applicable.

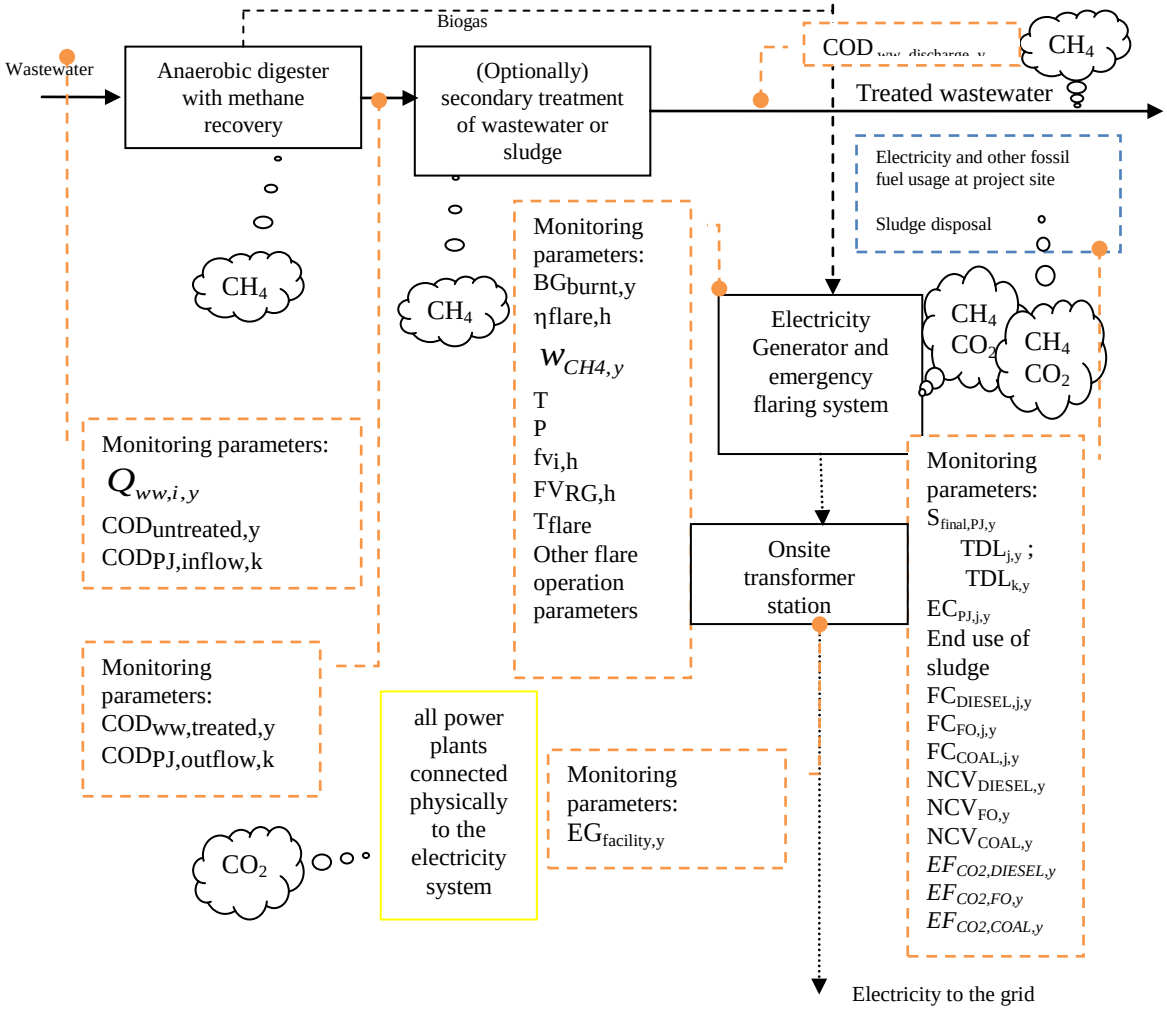


Figure B.7.2.1. Flowchart of Monitoring program and monitoring locations at the project

Reporting, archiving and preparation for periodic verification

The CPA Implementer will in principle report the monitoring data annually but may deviate to report at intervals corresponding to agreed verification periods and will ensure that these intervals are in accordance with CDM requirements. The CPA Implementer will ensure that all required documentation is made available to the verifier. Data record will be archived for a period of 2 years after the crediting period to which the records pertain.

Quality Assurance

The following quality assurance measures will be taken relating to the monitoring equipment and its installation and operation and data storage:

- All meters, sensing and sampling equipment have to be designed and manufactured to International standards.
- The central PLC used for managing the data requirements of the biogas plant will be located in a secure, sealed housing to prevent damage or tampering.
- Routine maintenance and calibration of all monitoring equipment will be performed in accordance with the manufacturer's specification to ensure that the data remains accurate.

- A paper backup of the monthly electronic data file will be stored in a secure location onsite.

To ensure the quality of the recorded data, all personnel will be trained in accordance with this monitoring plan.

PROCEDURES IN CASE OF DAMAGED METERING EQUIPMENT / EMERGENCIES

Damages to metering equipment:

Lost data due to equipment failure will be reconstructed from former and subsequent series measurements up to 6 months after the equipment failed. This is considered reasonable as despite a quality control, maintenance and auditing system in place, instrument failure and delays in replacement may still occur. During this period, additional evidence will be used to demonstrate the continuing of factory operations to avoid suspicion that the data is indeed missing due to instrument failure and not cessation of the production process.

In case of any unforeseen event that is not covered under this monitoring plan, the CPA implementer should be informed immediately. The problem should be remedied as soon as possible. Monitoring group should take measures to ensure avoid similar problem.

The CPA implementer will be responsible for managing the collection, and storing and archiving of all data and records. All relevant data will be archived electronically and backed up regularly.

Emergencies:

In case of emergencies, the project entity will not claim emission reductions due to the project activity for the duration of the emergency. The project entity will follow the below procedure for declaring the emergency period to be over:

3. The project entity will ensure that all requirements for monitoring of emission reductions have been re-established.
4. The monitoring officer and the head of operations of the power station will both sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

OPERATIONAL AND MANAGEMENT STRUCTURE FOR MONITORING

The monitoring of the emission reductions will be carried out according to the scheme shown in Figure B.7.2.2. The project entity will engage its CDM advisor, Blue World Carbon to assure that all monitoring requirements are met. Within the CPA Implementer a monitoring officer is appointed who will carry the day-to-day supervision responsibility. The first step is the measurement of the electrical energy supplied to the grid and reporting of daily operations, which will be carried out by the plant operation staff.

The monitoring officer who will be responsible for verification of the measurement, collection of sales receipts, collection of billing receipts of the power supplied by the grid to the power plant and the calculation of the emissions reductions. The monitoring officer will prepare operational reports of the project activity, recording the daily operation of the power station including operating periods, power delivered to the grid, equipment defects, etc. The selection procedure, tasks and responsibilities of the monitoring officer are described in detail in Annex 4. Finally, the monitoring reports will be reviewed by Blue World Carbon.

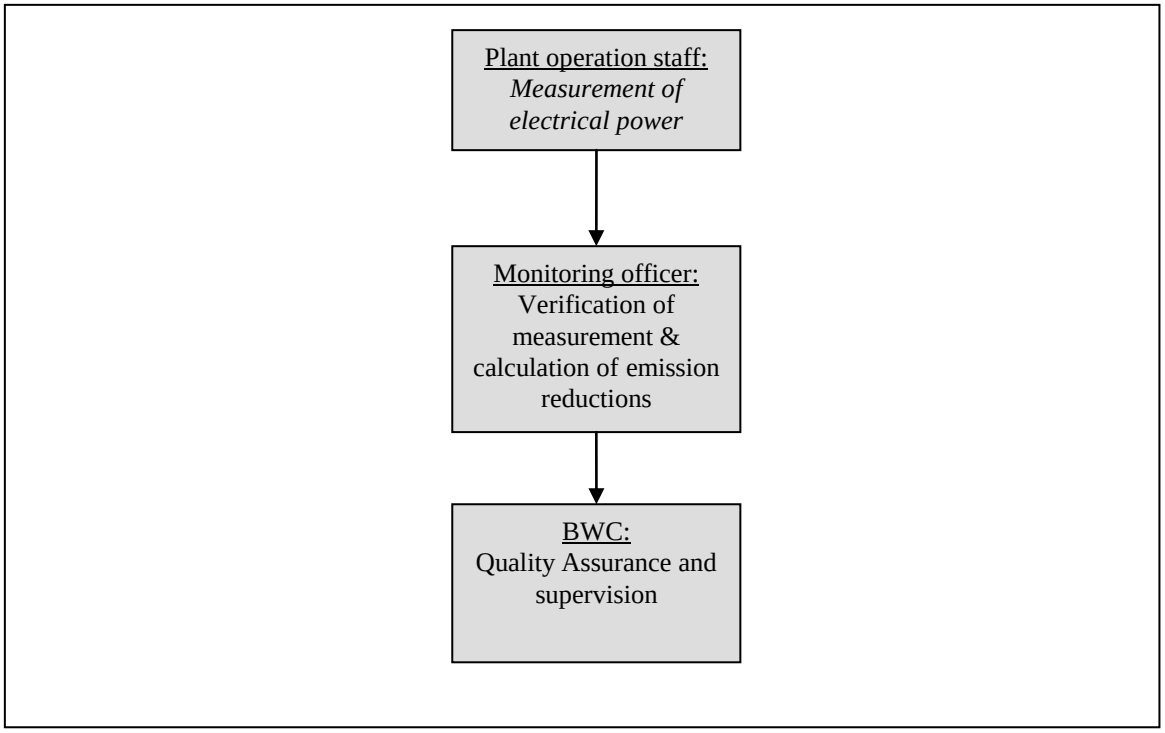


Figure B.7.2.2 **Management structure in order to monitor emission reductions**

- - - - -

Appendix 1: Contact information on entity/individual responsible for the PoA

Organization	PT Blue World Indonesia
Street/P.O. Box	Jl. Rasuna Said Kav. 13
Building	18th Floor Cyber 2 Tower
City	Jakarta
State/Region	Jakarta
Postcode	12950
Country	Indonesia
Telephone	+62 21 5799 8724
Fax	+62 21 57998988
E-mail	joost.van.acht@blueworldcarbon.com
Website	www.blueworldcarbon.com
Contact person	Joost Willem van Acht
Title	Managing Director
Salutation	Mr.
Last name	van Acht
Middle name	
First name	Joost Willem
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	joost.van.acht@blueworldcarbon.com

Organization	Blue World Carbon SEA Pte Ltd
Street/P.O. Box	19 China Street, #03-02 Far East Square
Building	
City	Singapore
State/Region	
Postcode	049561
Country	Singapore
Telephone	+65 63389411
Fax	+65 63389411
E-mail	joost.van.acht@blueworldcarbon.com
Website	www.blueworldcarbon.com
Contact person	Joost Willem van Acht
Title	Managing Director
Salutation	Mr.
Last name	van Acht
Middle name	
First name	Joost Willem
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	joost.van.acht@blueworldcarbon.com

Appendix 2: Affirmation regarding public funding

The PoA does not receive any public funding from Parties included in Annex I of the UNFCCC.

Appendix 3: Application of methodology(ies)

No further information is necessary as all generic CPA types comply with the applicability conditions of the methodology.

Appendix 4: Further background information on ex ante calculation of emission reductions

Further background information on the ex-ante calculation of emission reduction shall be provided on CPA level, for each individual CPA (where applicable).

Appendix 5: Further background information on the monitoring plan

Further background information on the monitoring plan shall be provided on CPA level, for each individual CPA (where applicable).

- - - - -

History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the programme design document form for small-scale CDM programmes of activities" (EB 66, Annex 13).
01	EB33, Annex43 27 July 2007	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		