

**Validation Report**



# CDM PoA Validation Report

**TBEC BIOGAS PROGRAMME FOR SOUTH EAST ASIA**

GLC Report No: 227, Rev. 09

# Validation Report

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Organisational Unit					
Germanischer Lloyd Certification GmbH (GLC), Greenhouse Gas Services					
Name of Client	Client reference person				
Thai Biogas Energy Company Limited (TBEC)	Mr. Lars Gustaf Godenhielm				
Summary:					
PoA Name:	TBEC Biogas Programme for South East Asia				
Generic CPA-DD	TBEC Biogas Programme for South East Asia CPA# [Insert CPA Number & CPA Descriptor]				
Project Host Country(ies):	Thailand				
Annex I Country(ies)	NA				
Coordinating / Managing Entity (CME) and Project Participants (PP):	Thai Biogas Energy Company Limited (TBEC)				
Sectoral Scope(s), Technical Area(s)	CDM Sectoral Scope 13, Technical Areas 13.1				
Name of applied Methodology(ies) /versions:	ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" version 04.1.0				
Project Size (Scale):	<input checked="" type="checkbox"/> Large Scale	<input type="checkbox"/> Small Scale			
ER Estimation of 1 <sup>st</sup> CPA:	148,952 t CO <sub>2eq</sub> total	21,279 t CO <sub>2eq</sub> per year			
Start date of the PoA and the crediting period:	31/12/2012 (or the date of registration, whichever is later)				
PoA Duration:	28 years				
CPA Crediting Period:	<input type="checkbox"/> Fixed (10 years)	<input checked="" type="checkbox"/> Renewable (7years)			
Validation opinion:	<input checked="" type="checkbox"/> Positive				
	<input type="checkbox"/> Negative				
Project Assessment Team:	Technical Review Team:	Project Approval:			
Srikanth Meesa Jun Wang Sithisakdi Apichatthanapath Benedikt Maibaum	Anu Chaudhary Jose-Emilio Moreno Ruifeng Li Markus Weber	Markus Weber			
Date of this revision:	Revision No.	Number of pages			
2012-08-30	09	121			
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## History of report revisions:

Rev.	Date	Person (short sign or name)	Function	Action
01	2012-07-18	Srikanth Meesa Jun Wang Sithisakdi Apichatthanapath	Auditor Auditor ATL	Draft Report
02	2012-07-25	Ruifeng Li	TE	Comments on draft report
03	2012-07-31	Anu Chaudhary	TR	Review with corrections and comments
04	2012-08-17	Sithisakdi Apichatthanapath	ATL	Addressing TR comments + editorial revision
05	2012-08-20	Jose-Emilio Moreno	TR	Review with comments
06	2012-08-21	Sithisakdi Apichatthanapath	ATL	Address additional TR's comments
07	2012-08-23	Anu Chaudhary	TR	Closure of review comments
08	2012-08-30	Sithisakdi Apichatthanapath	ATL	Minor editorial revision
09	2012-08-30	Markus Weber	FR+A	Final review and approved

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## Abbreviations

ACM	Approved Consolidated Methodology
BM	Build Margin
BOOT	Build Own Operate Transfer
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB	CDM Executive Board (the board)
CER	Certified Emission Reduction
CH <sub>4</sub>	Methane
CL	Clarification Request
CLBR	Covered Lagoon Bio-Reactor
CM	Combined Margin
CME	Coordinating and Managing Entity
COD	Chemical Oxygen Demand
CMP	Meeting of the Parties to the Kyoto Protocol
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> eq	Carbon dioxide equivalent
COP/MOP	The Conference of the Parties to the United Nations Framework Convention on Climate Change serving as the Meeting of the Parties to the Kyoto Protocol
CPA	CDM Programme Activity
CPA-DD	CDM Programme Activity Design Document
CPI	Consumer Price Index
DEDE	Department of Alternative Energy Development and Efficiency
DNA	Designated National Authority
DOE	Designated Operation Entity
EGAT	Electricity Generating Authority of Thailand
EIA	Environmental Impact Assessment
EF	Emission Factor
EPPO	Energy Policy and Planning Office
ER	Emission reduction(s)
FAR	Forward Action Request
FFB	Fresh Fruit Bunch (es)
GSC	Global Stakeholder Consultation
GHG	Greenhouse gas
GLC	Germanischer Lloyd Certification GmbH
GWP	Global Warming Potential
IEE	Initial Environmental Evaluation
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
LC/MR	Low-cost/must-run
LoA	Letter of Approval
MEA	Metropolitan Electricity Authority
MLR	Minimum Lending Rate
MoC	Modalities of Communication
MONRE	Ministry of Natural Resources and Environment

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NEPC	National Energy Policy Council
ODA	Official development assistance
O&M	Operation and maintenance
ORR	Organic Removal Ratio
PDD	Project Design Document
PEA	Provincial Electricity Authority
PoA	Programme of Activities
PoA-DD	Programme of Activities Design Document
POME	Palm Oil Mill Effluent
PP	Project Participant (s)
QESH	Quality, Environment, Safety and Health
ROE	Return on Equity
SET	Stock Exchange of Thailand
TBEC	Thai Biogas Energy Company Limited
THB	Thai Baht
TGO	Thailand Greenhouse Gas Management Organisation
TPH	Tonne Per Hour
UNFCCC	United Nations Framework Convention on Climate Change
VSPP	Very Small Power Producer
VVM	Validation and Verification Manual
VVS	Validation and Verification Standard
WACC	Weighted Average Cost of Capital

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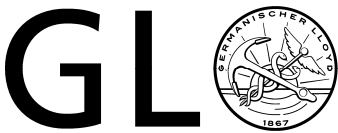
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## 1 INTRODUCTION

Thai Biogas Energy Company Limited (TBEC) (hereafter called "TBEC") has commissioned Germanischer Lloyd Certification GmbH (GLC) to perform the validation of the TBEC Biogas Programme for South East Asia (hereafter called "the PoA"), with its first CPA in Thailand (hereafter called "the 1<sup>st</sup> CPA" or "the specific CPA"). A typical CPA is referred to as "the project" or "the project activity". This validation report summarizes the findings of the validation of the PoA, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent PoA operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions made by COP/MOP and the CDM Executive Board.

### 1.1 Objective

The purpose of a validation is to have an independent third party assess the PoA design. In particular, the PoA's baseline, monitoring plan, and the PoA's compliance with relevant UNFCCC and host Party criteria are validated by a Designated Operational Entity (DOE) in order to confirm that the PoA design as documented in the completed:

- PoA Design Document (PoA-DD),
- CDM Project Activity Design Document generic (CPA-DD) with generic information relevant to all CPAs
- CPA-DD specific case<sup>1</sup> based on the application of the PoA to one real case
- Relevant supporting documents

The DOE confirms that the PoA meets the identified CDM criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the PoA and its intended generation of Certified Emission Reductions (CERs). The executing DOE can only provide a validation/inclusion opinion but the ultimate decision whether a project is registered or not rests with the CDM Executive Board (CDM-EB).

### 1.2 Scope and Criteria

The validation scope is defined as an independent and objective review of the PoA-DD, generic CPA-DD and the specific CPA-DD (together hereafter referred to as "PDDs") and supporting documentation. The PDDs and supporting documentation are reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board, including the Approved Baseline and Monitoring Methodology (ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" version 04.1.0)<sup>#</sup>. The validation was based on the recommendations and guidance of the Validation and Verification Manual, VVM version 1.2 <sup>/6/</sup> and PoA related CDM requirements according to EB 55 Annex 38 Procedure for registration of a programme of activities as a single project activity

<sup>1</sup> A separate validation report is provided for the inclusion of the specific CPA to the PoA.

<sup>#</sup> It is to be noted that ACM0014 version 05.0.0 has now been published but it is not yet enforced for this project, in accordance with paragraph 36 of the "Procedure for the submission and consideration of requests for revision of approved baseline and monitoring methodologies and tools for large-scale CDM project activities".

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version 4.1<sup>/27/</sup>, as well as the EB 65 Annex 3: Standard for demonstration of additionality, Development of eligibility criteria and Application of multiple methodologies for Programme of Activities <sup>/31/</sup>.

The validation does not provide any consulting towards the PP. However, stated requests for clarifications, corrective actions and/or forward actions may have provided input for improvement of the PoA design.

## 2 VALIDATION TEAM

### 2.1 Assessment Team

A competent team with relevant knowledge and experience in the specific scopes and sectors was appointed by GLC. The appointment of the team takes into account the required scope, technical area, knowledge of the host country and general project activity knowledge requirements for validating the PoA design and the relevant CERs that would be achieved by the CPA(s) under the PoA. The appointment of the audit team also includes a screening of everyone involved against any conflict of interest. The assessment team is composed of an Assessment Team Leader (ATL), Auditor (A) and Local Expert (LE), Financial Expert (FE) and Technical Expert (TE). Table 2-1 below shows the composition of the assessment team, their qualifications and/or functions.

Table 2-1: Validation team members, qualification and knowledge

Name (Surname , first name)	Function/Qualification	Sectoral scope specific knowledge	Technical area specific knowledge	Local knowledge	Type of involvement				
					Desk review	On-site visit / interviews	Reporting	Supervision of work	Expert input
Apichatthanapath, Sithisakdi	ATL/LE/FE			X	X	X	X	X	X
Meesa, Srikanth	A				X	X	X		
Wang, Jun	A				X	X	X		
Benedikt Maibaum	TE	X	X			X			X

## 2.2 Technical Review and Final Approval Team

Before submission of the final Validation Report to EB of the UNFCCC, a technical review of the whole validation procedure and the draft report was carried out by Technical Reviewer(s) appointed by GLC. The appointed technical reviewer team is composed of competent GHG auditors for the sectoral scope and technical area under which this PoA, esp. the 1<sup>st</sup> CPA falls. Each involved reviewer is not directly involved in the validation assessment up to the start of the internal technical review phase of this PoA.

As a result of the internal technical review process, the validation opinion and the topic specific assessments as prepared by the ATL may be confirmed or revised. Further reporting improvements might be achieved during the technical review and approval processes.

Finally, the PoA-DD, CPA-DD (generic and specific), validation reports and any document to be submitted to the EB have to undergo an internal quality control and completeness check before they are approved to be uploaded to start the request for registration of the validated PoA. The Technical Review team and the person responsible for approval of the report are found in the table below:

Table 2-2: Technical Review and Approval Team.

Name (Family name, given name)	Qualification / Function <sup>2</sup>	Technical Area Knowledge	Sectoral Scope Expertise	Type of Involvement	
				Review	Approval
Chaudhary Anu	R	X	X	X	
Moreno, Emilio	R			X	
Li, Ruifeng	TE	X	X	X	
Weber, Markus	FR + FA	X	X	X	X

<sup>2</sup> T: Trainee, R: Reviewer, TE: Technical Expert, FR: Final Reviewer, FA: Final Approval.

## 3 METHODOLOGY

The validation consists of the following three phases:

- I. Desk review of the PoA-DD, CPA-DD generic, CPA-DD Specific Case and other supporting documents. This includes the preliminary compliance check of the PoA design against the applicability conditions and with regard to baseline setting and eligible PoA measures and above all against the Eligibility Criteria for CPA Inclusion.
- II. On-site assessment and follow-up interviews (through email communications, telephone calls, *inter alia*) with PoA participants and stakeholders.
- III. Resolution of outstanding issues and the issuance of the draft validation report and opinion.
- IV. Technical review of the draft validation reports and other supporting documentation in order to ensure the correctness, completeness and depth of the reporting.
- V. Finally the report and supporting documentation has to be approved by a competent person before they are submitted to CDM-EB for request for registration.

This validation report summarizes the findings after all phases of the validation process have been completed. The following sections outline step I to III with more details (please refer to Section 2.2 above for step IV and V).

### 3.1 Desk Review of the PDDs and Supporting Documents

The initial version of the PDDs as well as other supporting background documents related to the PoA design and baseline submitted by the PP, were initially assessed in the context of a desk-review in order to verify the correctness, credibility and interpretation of the presented information. A further crosscheck of the information provided was done with information from other sources as available. Audit plan was prepared and submitted to the client prior to the on-site visit. Desk review is based on the first versions of the PoA-DD, CPA-DD generic and CPA-DD specific case of Thailand which were uploaded to launch the Global Stakeholder Consultation (GSC) on 21/12/2011.

A complete list of documentation reviewed during the validation process is presented as Information Reference in section 6 of this report.

### 3.2 On-Site Assessment and Follow-Up Interviews with PoA Stakeholders

From 24/01/2012 to 27/01/2012, members of the assessment team (Ms. Jun Wang, Mr. Benedikt Maibaum, Mr. Srikanth Meesa, and Mr. Sithisakdi Apichatthanaph) as appointed by GLC conducted an on-site audit at the following sites:

- Bangsawan palm oil mill (hereafter called “BSW palm oil mill”) in Surat Thani province, Thailand where the 1<sup>st</sup> CPA is located;
- Head Office of TBEC in Bangkok province, Thailand
- Office of the Thailand Greenhouse Gas Management Organization (TGO), Bangkok province, Thailand

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In the context of such on-site visits, GLC performed visual inspection to the Coordinating and Managing Entity (CME) office, the 1<sup>st</sup> CPA site, and an assessment of PoA related documents provided by the PP. The members of the validation team also conducted interviews with representatives of PoA stakeholders in order to confirm selected information and to resolve issues earlier identified during the desk review of documents. The main topics addressed during the interviews includes, inter alia:

- PoA design and adopted technology
- Demonstration of baseline and additionality
- PoA implementation timeline and any risk of delay
- GHG emission reduction calculations
- Application of the monitoring methodology as well as expected design and application of the monitoring and managing plan
- Local Stakeholder Consultation process
- Assessment of environmental impacts, environmental licensing and legal compliance of the PoA and baseline scenario with applicable regional and national legislation.
- Eligibility Criteria for inclusion of CPAs
- Calculation of emission reductions
- Letter of Approval by the respective countries' DNA
- Roles and responsibilities of the CME/PP w.r.t. programme management, monitoring and reporting

The names of those interviewed during the validation process are listed below in Table 3-1.

Table 3-1: Names of interviewed persons

Name	Organization / Position
Mr. Lars Gustaf Godenhielm	TBEC / Managing Director
Ms. Sunee Sudjai	TBEC / Staff
Mr. Sittisak Suksaisakorn	
Mr. Tawatchai Chanophuak	BSW / Managing Director
Mr. Wattanapong Khonkan	BSW / General Manager
Mr. Kittisak Kittisitho	BSW / Director
Mr. Nattaporn Urroj	
Ms. Bongkoj Kittisampan	TGO / Staff
Ms. Paweena Panichayapichet	
Ms. Penporn Petchsiri	
Mr. Paul Corletto	Carbon Bridge / Asia Regional Manager
Mr. Nusorn Intpaf	Bangsawan sub-district / sub-district headman
Ms. Chonprapa Nakaew	Bangsawan sub-district / Villagers
Ms. Rattana Petchtrom	
Mr. Somkid Dejrit	

## 3.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation was to resolve any outstanding issues which needed to be clarified prior to GLC's final conclusion on the PoA design as described in the PoA Design Document (PoA-DD) and supporting documentation. In order to ensure transparency, a validation questionnaire was customised for the PoA, according to the valid version of the applied methodology ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" version 04.1.0 <sup>/2/</sup> and Validation and Verification Manual (VVM) <sup>/6/</sup> and PoA related CDM requirements according to EB 55 Annex 38 Procedure for registration of a programme of activities as a single project activity version 4.1<sup>/27/</sup>, as well as other relevant EB guidance. This questionnaire shows in transparent manner VVM requirements, source, means and findings of validation as well as the results from validating the identified criteria. The validation questionnaire serves the following purposes:

- It organises, details and clarifies the requirements a CDM project activity / PoA is expected to meet;
- It ensures a transparent validation process where the validators will document how a particular requirement has been validated and the result of the validation.

The validation questionnaire consists of one table with sub-sections. These sections are related to the different topics which have to be validated and checked with respect to the VVM and PoA requirements. The completed validation questionnaire for the TBEC Biogas Programme for South East Asia is enclosed in Annex A to this report. The different columns of this questionnaire are explained in Table 3-2. Findings established during the validation can either be seen as a non-fulfilment of criteria of the applicable CDM baseline and monitoring methodology, and/or applicable criteria of the CDM or where a risk to the fulfilment of PoA objectives is identified.

Corrective action requests (CAR) are issued, where:

- i) the PoA participants have made mistakes that will influence the ability of the PoA to achieve real, measurable additional emission reductions; or
- ii) applicable baseline and monitoring methodology, and/or applicable criteria of the CDM have not been met; or
- iii) there is a risk that emission reductions cannot be monitored or calculated or that the PoA would not be accepted as CDM project activity

A clarification request (CL) may be used provided information is insufficient or not clear enough to determine whether the applicable CDM PoA requirements have been met or where additional information is needed to fully clarify a particular issue.

The validation questionnaire consists of individual frames for each Corrective action requests (CAR) and clarification request (CL) raised. The content of each frame is described in the figure below. To guarantee the transparency of the validation process, the concerns raised by GLC and the responses provided by the PoA participants are fully documented in Annex A of this report.

Forward Action Requests (FARs) are issued during validation to highlight issues related to PoA implementation that require review/assessment during the subsequent verification(s) of the PoA. FARs are not related to the CDM requirements for registration.

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The findings are separately presented in a findings list table which is also attached in Annex A. The different columns of this list are explained in Table 3-3.

The resolution of all the PoA-DD related twenty-four (24) CARs and six (6) CLs, as well as generic CPA-DD related one (1) CAR, is enclosed in Annex A of this Validation Report. The table shows the interaction between the PoA participants on one hand and GLC audit team on the other hand which resulted in the revision of the final PoA-DD <sup>/36/</sup>, as well as the consistently revised final version of generic CPA-DD <sup>/38/</sup>. Upon successful closure of the raised CARs and CLs, the assessment team confirms that there are no remaining non-conformities.

Table 3-2: Structure of the Validation Questionnaire

<i>CHECKLIST QUESTION / VVM and PoA REQUIREMENTS</i>	<i>SOURCE</i>	<i>MEANS AND FINDINGS OF VALIDATION</i>	<i>Assessment based on POA-DD and CPA-DDs in GSP</i>	<i>Conclusion based on Final PoA-DD and CPA-DDs</i>
Lists CDM requirements which the PoA should meet. The checklist is organised in several different sections. Each section is then further sub-divided. The lowest level constitutes a checklist question.	Gives reference to documents where the checklist question or item is from.	The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.	This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR), Clarification request (CL), or Forward Action Request (FAR).	This is either: OK, when the Draft Conclusion is OK or raised CAR/CLs have been successfully closed out; OK, with only FAR remaining; Or: CAR/CLs

Table 3-3: Structure of the Findings List – Resolution of CARs, CLs

<b>Description of Finding (CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what is required and why; address the context (e.g. section)</i>	<b>PoA Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Conclusion (OK / Not OK)</b>
In this column a finding is described in a clear and transparent manner. It also shall be described which further information is needed or which correction must be applied. The date of issue is also indicated.	In this column the PP shall provide a clear statement how to close the finding. This statement shall be sustained with suitable arguments and evidence. The date which the response is submitted is also indicated.	In this column GLC shall provide the conclusion of the assessment. The finding can be closed here or if the argumentation and/or evidence are not suitable a new line below with the continuation of the finding will be opened. The date when the response is assessed is also indicated.	GLC indicates whether the issue raised in the finding has been closed out or not closed out.

## 4 VALIDATION REPORTING

### 4.1 Coordinating and Managing Entity, PoA Participants and Parties Approval

Document review and background research is used as means of validation of participation requirements.

The project participant of the PoA is:

- Thai Biogas Energy Company Limited (TBEC) approved by Thailand DNA, through the Letter of Approval of Thailand dated 26/07/2012 <sup>/39/</sup>

Thai Biogas Energy Company Limited (TBEC) is also the CME of the PoA.

The DNA of Thailand is Thailand Greenhouse Gas Management Organisation (TGO). The information of DNA has been cross-checked by the validation team against that published on the UNFCCC CDM website (<http://cdm.unfccc.int/DNA/index.html>). Project participants are listed in a tabular form in section A.3 of the PoA-DD and this information is consistent with that provided in Annex I of the PoA-DD <sup>/36/</sup>. No entities other than those approved as project participants are included in these sections of the PoA-DD.

The Letter of Approval of Thailand for Thai Biogas Energy Company Limited (TBEC) is received from the project participant, which confirms that:

- Thailand is a party to Kyoto Protocol;
- The participation is voluntary;
- TBEC Biogas Programme for South East Asia complies with the requirements and contributes to sustainable development of Thailand.

It is to be noted that as per interview with DNA staff, the validation team can confirm that issuance of LoA for PoA in Thailand also requires reviewing and approval of project documentations for the 1<sup>st</sup> CPA specific. Hence, the Thailand approval of TBEC Biogas Programme for South East Asia also constitutes approval of the 1<sup>st</sup> CPA.

By means of verifying the submitted LoA, GLC has independently contacted host country DNA (as per telephone interview with TGO's staff, Ms. Pimchanok Morknoi, on 15/08/2012) who confirmed the issuance of LoA for TBEC Biogas Programme for South East Asia. Thus, Thailand approval is deemed as authentic.

After checking the LoA <sup>/39/</sup>, the validation team confirms that the letter refers to the PoA title fully consistent with that in the PoA-DD, i.e. TBEC Biogas Programme for South East Asia. The validation team hence considers the approval as unconditional. The LoA does not specify a version number of the PoA-DD or validation report. The project fulfils all relevant requirements.

### 4.2 PoA and CPA Design Documents

GLC can confirm that the PoA-DD, CPA-DD generic and CPA-DD specific case have been completed in accordance with relevant Form and Guidance as provided by UNFCCC. PoA-DD, CPA-DD generic and

CPA-DD specific have applied the valid version PoA and CPA-DD templates <sup>/33/, /34/</sup>. Validation team is able to also confirm that the PoA-DD, generic CPA-DD and real case CPA-DD have been completed in accordance with EB 55 Annex 38 (Procedure for registration of a programme of activities as a single project activity, version 4.1) <sup>/27/</sup>.

## 4.3 PoA Description - Policy/Measure/Technology or Stated Goal of the PoA

The main objectives of this Programme of Activity (PoA) are to reduce the greenhouse gas emissions from industrial wastewater treatment and to promote the consumption of renewable energy by using biogas generated from the wastewater treatment systems as a fuel.

The PoA is applicable to activities that aim to reduce methane emissions from industrial wastewater treatment. It is applicable to both existing facilities and Greenfield facilities where the baseline scenario is demonstrated to result in greenhouse gas emissions. The PoA will apply the large scale CDM methodology ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" version 04.1.0 <sup>/2/</sup> which quantifies the emissions reductions achieved by the capture/destruction of methane, production of renewable electricity and production of renewable biogas fuel for energy use.

The PoA will apply to technologies which conform to Scenario 1 in Table 1 of the methodology <sup>/2/</sup> whereby the project activity involves treatment of wastewater in a new anaerobic digester. In accordance with Scenario 1 of the methodology <sup>/2/</sup>, the CPA will alter the pre-project scenario of open lagoons by installing a new anaerobic digester. In the pre-project situation, wastewater from the industrial facility would be directed to open lagoons. In the project situation, wastewater from the industrial facility is directed to a new anaerobic digester. The residual from the anaerobic digester, after treatment, is directed to open lagoons or is treated under clearly aerobic conditions (e.g. dewatering and land application). The biogas extracted from the anaerobic digester and, if applicable, biogas generated from the treatment of solid materials, is flared and/or used to generate electricity and/or heat. The CPAs of this PoA must therefore include the following technology measure:

- (1) Installation of a new anaerobic digester with methane recovery for treatment of wastewater

In addition, one or more of the following technology measures may be included:

- (2) Destruction of recovered methane in a burner to produce useful heat energy
- (3) Destruction of recovered methane in power generation equipment to produce renewable electricity
- (4) Destruction of recovered methane in a flare

As demonstrated in the PoA-DD <sup>/36/</sup>, the PoA will implement environmentally safe and sound technologies which will reduce methane emissions from wastewater processing. The typical CPAs will involve technology transfer e.g. with the use of imported gas engines to Thailand.

It was observed that the PoA is intended to implement 1<sup>st</sup> CPA in Thailand (the current geographical boundary of the PoA), and after the PoA registration, the boundary of the PoA is anticipated to be extended to other countries within Southeast Asia. The boundary of the PoA will be amended post-

registration in accordance with the procedure provide in EB60, Annex 26 <sup>/3/</sup>.

The PoA will be managed and coordinated by TBEC, the CME. TBEC Biogas Programme for South East Asia is a voluntary action by TBEC, a private entity with no legal obligation to pursue the implementation of biogas systems. TBEC will ensure all CPAs to be included in the PoA meet the eligibility criteria requirements. It is to be noted that TBEC is also the CPA implementer of the 1<sup>st</sup> CPA. Validation team has noted that TBEC has extensive experience in the implementation of the biogas projects, and all of its projects in Thailand have been registered as CDM activities.

In all, the description of the PoA is deemed complete, accurate and in compliance with CDM requirements. The PoA-DD and generic CPA-DD are consistent.

## 4.4 Eligibility Criteria for CPA Inclusion under the PoA

The Coordinating and Managing Entity (CME) has outlined clear and unambiguous Eligibility Criteria for the inclusion of a CPA under this PoA as follows:

**Table 4.3: Eligibility criteria for inclusion of a CPA in the PoA**

#	Eligibility	Description	Reference/Supporting Document
1	The CPA implementer is identified in the CPA-DD	The CPA implementer must be identified in the CPA-DD and recorded in the CME database	CPA-DD Specific
2	The wastewater treatment technology implemented by the CPA conforms to the Project Activity described in the methodology ACM0014 Version 04.1.0.	The CPA wastewater treatment technology involves the installation of an anaerobic digester with methane recovery.	One of the following: (a) Project Investment Memorandum (b) Project Feasibility Study (c) Project Design Drawings
3	The methane destruction technology implemented by the CPA conforms to the Project Activity described in the methodology ACM0014 Version 04.1.0.	If relevant, the CPA achieves destruction of recovered methane through one or more of the following options: (1) Flare(s) (2) Electricity generation equipment (i.e. gas genset) (3) Heat generation equipment (i.e. boiler with gas burner or other types suitable to individual CPAs)	One of the following: (a) Project Investment Memorandum (b) Project Feasibility Study (c) Project Design Drawings
4	The CPA conforms to all applicability conditions and other requirements of the methodology and tools applied by the CPA.	The CPA will conform to all applicability conditions and other requirements of the methodologies and tools listed in section E.1 [of the PoA-DD].	CPA-DD Specific and the supporting documents specified in section E.2 [of the CPA-DD] will be submitted to the DOE during the CPA inclusion process.
5	The CPA is located in the physical geographical	The PoA will commence with projects located in Thailand and may	GPS-co-ordinates of CPA site location

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	boundary described in this PoA-DD.	be expanded to other countries in South East Asia through post-registration changes to the PoA.	
6	The CPA is uniquely identifiable.	Each CPA must be assigned a unique identification number and be recorded in the CMEs database.	(a) Unique Identification Number (recorded in CPA-DD Specific) (b) CME's PoA database
7	The CPA does not result in double accounting of greenhouse gases.	CPA implementer will provide a signed declaration to confirm that the CPA is not registered either as a CDM project activity or as a CPA of another PoA. The CME will also review the UNFCCC CDM online database verifying this CPA is not registered either as a CDM project activity or as a CPA of another PoA.	Signed declaration by CPA implementer.  Review of the UNFCCC CDM online database verifying this CPA is not registered either as a CDM project activity or as a CPA of another PoA.
8	The CPA conforms to specifications of technology/ measure including the level and type of service, performance specifications including compliance with testing/certifications.	The CPA measure is: Methane destruction, and if applicable, with energy production. The CPA technology is: Biogas capture for destruction and/or energy production. The CPA service is: Recovery and combustion of methane at an industrial wastewater treatment facility, and if applicable, energy production. With reference to the relevant regulations in section A.4.1.2 [of the PoA-DD] there are no national standards for level of service, performance specification or compliance with testing/certifications. However, TBEC will comply with all regulations and have established the following criteria: Level of service: Production of energy in the form of biogas with methane content greater than 40% and COD removal ratio greater than 50% between the anaerobic digester inlet and outlet. At the time of CPA inclusion, testing/certification is not required due to the nature of the CPA projects which will involve construction of site specific processing facilities at industrial installations. The design process flow diagram and design specifications provided by	The design process flow diagram and design specification provided by engineering consultants or equipment suppliers (if available at time of CPA-DD development) are considered sufficient evidence for this PoA. If the CPA is in operation at the time of inclusion, any measurements of COD will be according to national or international standards.

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		<p>engineering consultants or equipment suppliers is sufficient to demonstrate compliance with the above level of service.</p> <p>Any COD tests carried out by TBEC will be conducted to international standards. TBEC's will utilize the Hach meter (or equivalent) following international COD standard method 5220 D. Due to the variable nature of wastewater from industrial facilities, the above criteria will only be considered to be applicable when the biogas facility is operating at a level consistent with the normal design parameters for the specific site. As such, the above criteria are not relevant when the industrial plant is shut down or during start-up periods.</p>	
9	The PoA will involve CPAs under the direct management of TBEC.	The CPA implementer identified in the CPA-DD will be TBEC.	Contractual agreement regarding implementation of the CPA.
10	The CPA implementer is aware that they have agreed that their activity is being subscribed to the PoA.	The CME must receive a signed declaration from the CPA implementer confirming that they are aware and have agreed that their activity is being subscribed to the PoA	Signed declaration by CPA implementer.
11	The CPA implementer is undertaking a voluntary action and is not implementing a mandatory policy/regulation	The CME must receive a signed declaration from the CPA implementer confirming that they are undertaking a voluntary action and not implementing a mandatory policy/regulation. The CME will also cross-check against local regulations to ensure that the CPA is not implementing a mandatory policy/regulation, this will be recorded in the CPA-DD.	<p>(a) Declaration by CPA implementer stating that it is a voluntary initiative.</p> <p>(b) The details of relevant policy/regulations will be recorded in the CPA-DD Specific</p>
12	The CPA is additional.	The additionality of each CPA will be demonstrated by establishing that in the absence of CDM, none of the implemented CPAs would occur. The PoA will include large scale projects as CPAs and therefore will apply the additionality requirements of the large scale methodology ACM0014 which specifies that the	<p>"Tool for the demonstration and assessment of additionality" Version 6.0.0, EB65, Annex 21</p> <p>"Guidelines on the assessment of investment analysis" Version 5.0.0., EB62, Annex 5</p> <p>"Guidelines for objective</p>

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		<p>additionality will be demonstrated by applying the “Tool for the demonstration and assessment of additionality”, Version 6.0.0, EB65. The additionality will be assessed and demonstrated at the CPA level and each CPA will provide an explanation of how the above procedures have been applied to the specific CPA project situation.</p> <p>In the assessment of Step 1 in section E.5.1 [of the PoA-DD], the key criteria to be applied shall be in accordance with the “Procedure for the identification of the most plausible baseline scenario” in ACM0014, Version 4.1.0, EB58.</p> <p>In the assessment of Step 2 in section E.5.1 [of the PoA-DD], the key criteria to be applied shall be in accordance with the “Guidelines on the assessment of investment analysis” Version 5.0.0., EB62, Annex 5.</p> <p>In the assessment of Step 3 in section E.5.1 [of the PoA-DD], the key criteria to be applied shall be in accordance with the “Guidelines for objective demonstration and assessment of barriers”, Version 1.0, EB50 Annex 13.</p> <p>In the assessment of Step 4 in section E.5.1 [of the PoA-DD], the key criteria to be applied shall be in accordance with paragraphs 6,7,8,9 and 47 of the “Tool for the demonstration and assessment of additionality” Version 6.0.0, EB65, Annex 21.</p>	<p>demonstration and assessment of barriers”, Version 1.0, EB50 Annex 13</p> <p>Compliance with the above requirements will be recorded in the CPA-DD Specific and the supporting documents to justify the same will be submitted to the DOE for validation.</p>
13	The CPA start date is not prior to the start date of validation of the PoA.	The earliest date at which either the implementation or construction or real action of the CPA is not prior to the start date of validation of the PoA which was 21/12/2011.	If available, purchase orders and equipment contracts associated with construction or real action.
14	Local stakeholder comments have been	A local stakeholder consultation meeting will be organized and	Local Stakeholder Consultation report.

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	invited at the CPA level.	documented in the CPA-DD.	
15	The environmental analysis has been performed at the CPA level.	An environmental analysis will be organized and documented in the CPA-DD.	Environmental analysis report.
16	The CPA crediting period does not exceed the PoA end date.	Each CPA crediting period will be defined in the CPA-DD together with a statement that the CPA crediting period will not exceed the PoA end date.	A written affirmation from the CPA implementer that the CPA crediting period will not exceed the PoA end date.
17	Funding from Annex I parties, if any, does not result in a diversion of official development assistance;	Funding for each CPA will not result in a diversion of official development assistance;	A written affirmation from the CPA implementer that the project funding does not result in a diversion of official development assistance;
18	CPA shall be approved by the CME.	The CME shall official approve each CPA for inclusion in the PoA.	A written affirmation from the CME that the CPA is approved for inclusion in the PoA.
19	The CPA is implemented within the PoA target group.	The PoA target group includes all installations with an industrial wastewater treatment facility.	CPA-DD Specific and the supporting documents to justify the same will be submitted to the DOE during the CPA inclusion process.
20	The CPA technology will treat high strength organic rich wastewater.	Wastewater treated by the CPA technology will have a COD greater than 2,000 mg/l.	Data required for parameter COD <sub>in,x</sub> described in section E.6.3 of this PoA-DD will be recorded in the CPA-DD and used to confirm the COD of wastewater to be treated by the CPA is greater than 2,000 mg/l. COD tests results conducted by 3 <sup>rd</sup> party laboratory will be used as supporting document.

The eligibility criteria, listed in PoA-DD section A.4.2.2 and section B.2 of the generic CPA-DD, have been validated by GLC with regards to the applicability of the applied methodology ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" version 04.1.0 <sup>/2/</sup>, the published "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities" version 01.0 <sup>/31/</sup>, Validation and Verification Manual <sup>/6/</sup>, and also requirements stipulated by host country DNA as part of LoA approval.

It is to be noted that, as included in the eligibility criteria, each CPA will have to demonstrate additionality individually at CPA level following the "Tool for the demonstration and assessment of additionality" Version 6.0.0 <sup>/5/</sup> and the relevant/corresponding guidelines and this will be checked at the CPA level by the CME and further confirmed by the contracting DOE during the validation of CPA inclusion. The same is assessed as in compliance with "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities" <sup>/31/</sup>

Each CPA will have to meet all the defined eligibility criteria to ensure eligibility to participate in this PoA.

In conclusion, the eligibility criteria as listed in PoA-DD <sup>/36/</sup> section A.4.2.2 and also in section B.2 of the generic CPA-DD <sup>/38/</sup>, and validated by GLC, is in agreement with the Validation and Verification Manual <sup>/6/</sup> paragraph 167 which states that Eligibility Criteria should “...include *inter alia* the means of demonstrating the additionality of the CPA and the applicability of the applied methodology.” A CAR was raised since the PoA-DD published for Global Stakeholder Comments (GSC) does not cover the required/relevant conditions in detail (please refer to Annex A). It is confirmed that the finding was addressed appropriately and the PoA-DD was revised to include all the relevant conditions in the eligibility criteria. Correctness and completeness of the eligibility criteria was assessed and documented through the questionnaire and responses to findings raised, as shown in Annex A. In all, GLC can confirm that the eligibility criteria are sufficient, objective and comprehensive to permit the assessment of the inclusion of CPAs in the PoA in compliance with para 16 of the “Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities” <sup>/31/</sup>. Compliance to the eligibility criteria would be validated by the contracting DOE during CPAs inclusion. For 1<sup>st</sup> CPA, please refer to GLC’s corresponding validation report.

## 4.5 The PoA Operational and Management Plan

Based on the document review and interview, validation team understands that as per section A.3 of the PoA-DD <sup>/36/</sup> that Thai Biogas Energy Company Limited (TBEC) is the CME which will be communicating with the Executive Board. The operation and management of the PoA will be coordinated by the CME. Moreover, the overall responsibility of the operational and management plan including responsibility for liaison with all parties involved lies with the CME. The CME will enter into a contractual relationship with the implementers of the various CPAs and provide training on data monitoring and on how to operate the CPAs.

TBEC has implemented a PoA management system, as documented in its protocol, “CPA inclusion management system document” <sup>/18/</sup>. GLC confirms the management system includes the following aspects in order to meet CDM requirements:

- CPA Inclusion Management System Supporting Documents;
- Roles and Responsibilities;
- Arrangements for Training and Capacity Development of Personnel;
- Procedures to Avoid Double Counting;
- Records and Documentation Control Processes;
- Inclusion Management System Continuous Improvement;
- CPA Inclusion Management System Compliance with EB Requirements.

CME has also developed PoA database <sup>/18/</sup>. After review, GLC can confirm that the database (with 1<sup>st</sup> specific CPA being used as showcase) includes the following details:

- Identification of the CPA implementer;
- Contact details of the location;
- Unique identifications details of the CPA;
- All the required and relevant eligibility criteria;

- Provision for recording of monitoring and verification data.

It is noted that the CPA inclusion management system document <sup>/18/</sup> not only includes procedures, but where applicable, undertaking/contract templates, to be applied for confirming below requirements.

- The PoA will involve only CPAs under the direct management of TBEC (as per host country DNA requirement);
- The CPA implementer is aware that the CPA will be subscribed to this PoA;
- The CPA implementer is undertaking a voluntary action and is not implementing a mandatory policy/regulation;
- The CPA implementer certifies that the CPA is not registered under the Clean Development Mechanism of the UNFCCC.

Regarding the latter point, it is to be noted that the CME will further review the UNFCCC CDM online database to verify that the CPA is not registered either as a CDM project activity or as a CPA of another PoA as to ensure avoidance of double counting.

Thai Biogas Energy Company Limited (TBEC) will periodically collect monitoring data, calculate emission reductions and prepare monitoring reports.

All project activities in each CPA will be verified. Therefore, the sampling method/procedure (other than those required at specific CPA level e.g. COD analysis, %CH<sub>4</sub> test) will not be used for verification of the amount of reductions of anthropogenic emission by sources of greenhouse gases achieved by CPAs under this PoA. The CME will be responsible for the management of the PoA monitoring database, consisting of the basic data for inclusion and retain copies of all CPA monitoring records. All records will be stored for a period of two years after the end of the relevant crediting period or the last issuance whichever is later. Relevant data capture, verification and storage procedures will be followed in maintaining data, as to ensure accuracy, validity and completeness.

The overall responsibility for the application, management and improvement of the CPA inclusion management system is 'QESH & CDM Department Manager', who has been assessed as having sound technical background and relevant CDM experience for such role. The same may delegate responsibility to other in-house or outsourced staff who, through relevant trainings and satisfactory performance reviews, have completed and able to keep current documents: *1.2 Personal Training and Capacity Development Register*, and *1.3 Personal Review and Development Plan prior to commencement of work on the CPA inclusion management system*. The arrangements of this training and capacity development prior to the commencing implementation of the CPA inclusion management system as well as annual review of competencies of the staff must be completed by QESH & CDM Department Manager and further approved by the 'Line Manager'. Records of the same will be kept as per the documents mentioned above. The PoA management system also contains procedures for technical review of inclusion of CPAs, describing detailed process and sub-process steps, and the required documents to ensure that all CPAs to be included meet the relevant requirements described in the PoA-DD. The validation team also found that monitoring and measurement activities and corrective actions processes are in place in order to assure continual improvement of the PoA management system. The PoA management system record keeping and document processes are based on standards for quality management systems (e.g. ISO 90001). Control procedures for the defined relevant documents include

collection process, ownership rights, approval processes, document identification, storage, retrieval and disposal processes. <sup>/18/</sup>

In all, GLC can therefore confirm that the CME with the structure in place will be able to manage and coordinate the PoA as described in the PoA-DD according to the requirements of Validation and Verification Manual, paragraph 166 <sup>/6/</sup>. In other words, the structure is *“sufficient to ensure that the coordinating/managing entity will have control of all records and information related to the implementation of individual CPAs and will be in a position to ensure each CPA is being operated in accordance with the specific requirements of the programme”*.

## 4.6 Monitoring Plan of a typical CPA

All parameters to be monitored for each CPA will be monitored according to the Monitoring Plan outlined in Section E.7 of the final PoA-DD <sup>/36/</sup>.

In accordance with the applied methodology and tools, all monitoring parameters required are contained in a complete manner in the defined monitoring plan.

Summary of the procedures/means of measurement for all relevant monitoring is provided below:

Table: 4.5: Summary of PoA monitoring plan

Parameter	Description	Monitoring /recording frequency, measurement methods and procedures, QA/QC procedures
$F_{PJ,dig,m}$ (m <sup>3</sup> /month)	Quantity of wastewater that is treated in the anaerobic digester in the project activity in month <i>m</i>	Parameter monitored continuously using flow meters but aggregated annually for calculations, The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD. If the solid materials are also treated in the baseline and project scenario, the $F_{PJ,dig,m}$ does not account the amount of solid materials treated or separated from the wastewater stream in the anaerobic digester, if applicable
$w_{COD,dig,m}$ (t COD/m <sup>3</sup> )	Average chemical oxygen demand in the wastewater that is treated in the anaerobic digester in the project activity in month <i>m</i>	Measure the COD according to national or international standards Regularly, calculate average monthly and annual values The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD. In case of Scenario 1, if the solid materials are also treated in the baseline and project scenario, the $w_{COD,dig,m}$ is not calculated for the solid materials treated or separated from the wastewater stream in the anaerobic digester, if applicable
$w_{s,y}$ (kg/m <sup>3</sup> )	Average concentration of chemical oxidative	Measure the COD according to national or international standards Regularly, calculate average monthly and annual values The equipment will be calibrated in accordance with manufacturer's

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	substance <i>s</i> in the wastewater treated in the digester in year <i>y</i>	<p>requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.</p> <p>Applicable for organic removal ratio method (baseline emissions)</p> <p>Applicable if chemical oxidative substance are present in the wastewater</p>
$T_{2,m}$ (K)	Average temperature at the project site in month <i>m</i>	<p>National or regional weather statistics</p> <p>Continuously, aggregated in monthly average values</p> <p>Applicable for the methane conversion factor method</p>
$EG_{PJ,y}$ (MWh/year)	Net quantity of electricity generated in year <i>y</i> with biogas from the new anaerobic biodigester (Net electricity sold to the grid)	<p>Measured continuously with an electricity meter and monitored daily. The meter will measure electricity sold to the grid and represent net electricity sold to the grid.</p> <p>The meters will be calibrated as per the manufacturer's recommendation or once per year. As a backup, in case the meters for net electricity fail, the net electricity will be calculated as Gross generation (monitored by internal meters); minus electricity consumed by the Auxiliary load of the biogas plant.</p> <p>The net electricity sold to the grid will be cross checked against invoices from the power company.</p> <p>Biogas generated from solid materials is to be separately monitored in order to discount the part of renewable electricity generation from <math>EG_{PJ,y}</math> caused by digestion of solid materials. Total net exported heat/power shall be multiplied with a ratio <math>R_{biogas,SM,y}</math> in order to determine only the relevant amount of baseline heat/power emissions for calculation of emission reductions, where:</p> $R_{biogas,SM,y} = \frac{F_{biogas,y} \times w_{CH4,biogas,y} - F_{biogas,SM,y} \times w_{CH4,biogas,SM,y}}{F_{biogas,y} \times w_{CH4,biogas,y}}$
$HG_{PJ,y}$ (GJ/year)	Net quantity of heat generated in year <i>y</i> with biogas from the new anaerobic digester	<p>Measured from the heat received by the heated process; else: calculated on the basis of measurement of the volume of biogas captured and used for heat generation multiplied by the methane content of the gas, CV methane, and the efficiency of the boiler during the project (i.e. with biogas)</p> <p>Monitored daily</p> <p>The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.</p> <p>Biogas generated from solid materials is to be separately monitored in order to discount the part of heat generated from <math>HG_{PJ,y}</math>, caused by digestion of solid materials. Total net exported heat/power shall be multiplied with a ratio <math>R_{biogas,SM,y}</math> in order to determine only the relevant amount of baseline heat/power emissions for calculation of emission reductions, where:</p> $R_{biogas,SM,y} = \frac{F_{biogas,y} \times w_{CH4,biogas,y} - F_{biogas,SM,y} \times w_{CH4,biogas,SM,y}}{F_{biogas,y} \times w_{CH4,biogas,y}}$
$F_{PJ,effl,dig,m}$	$F_{PJ,effl,dig,m}$	= Parameter monitored continuously but aggregated monthly for

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$F_{PJ,effl,lag,m}$ (m <sup>3</sup> /month)	Quantity of effluent from the digester in month $m$ $F_{PJ,effl,lag,m}$ = Quantity of effluent from the open lagoon or dewatering facility in which the effluent from the digester is treated in month $m$	calculations The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.
$S_{LA,m}$ $DWW_{LA,m}$ (t/month)	$S_{LA,m}$ = Amount of sludge applied to land in month $m$ $DWW_{LA,m}$ = Amount of dewatered wastewater applied to land in month $m$	Parameter monitored continuously but aggregated monthly for calculations Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.
$W_{COD,effl,dig,m}$ $W_{COD,effl,lag,m}$ (t COD/m <sup>3</sup> )	$W_{COD,effl,dig,m}$ = Average chemical oxygen demand in the effluent from the digester in month $m$ $W_{COD,effl,lag,m}$ = Average chemical oxygen demand in the effluent from the open lagoon or dewatering facility in which the effluent from the digester is treated in month $m$	Measure the COD according to national or international standards Sampled and tested regularly, calculate average monthly and annual values The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.
$W_{sludge,COD,LA,m}$ (t COD/t sludge)	Average chemical oxygen demand in the sludge applied to land after the dewatering process in month $m$	Measure the COD according to national or international standards Sampled and tested regularly, calculate average monthly and annual values The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.
$W_{ww,COD,LA,m}$ (t COD/t dewatered)	Average chemical oxygen demand in the dewatered	Measure the COD according to national or international standards Sampled and tested regularly, calculate average monthly and annual values,

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wastewater)	wastewater in month $m$	The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.
$W_{S,effl,y}$ (kg/m <sup>3</sup> )	Average concentration of chemical oxidative substance $s$ in the effluent from the digester in year $y$	Measure according to national or international standards Regularly, calculate average monthly and annual values The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD. Applicable for organic removal ratio method
$W_{N,sludge,m}$ (t N/t sludge)	Mass fraction of nitrogen in the sludge applied to land in month $m$	Measured according to national or international standards Measured regularly, calculate average monthly The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.
$W_{N,ww,m}$ (t N/t dewatered wastewater)	Mass fraction of nitrogen in the wastewater applied to land in month $m$	Measured according to national or international standards Regularly, calculate average monthly The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.
$SM_{PJ,k,y}$ (tons of dry matter)	Quantity of solid materials type $k$ during the year $y$	On-site measurements Use weight meters and adjust for the moisture content in order to determine the quantity of dry matter Measured daily, calculate monthly and annual values Meters will undergo maintenance/calibration subject to appropriate industry standards. The frequency of calibration and control procedures would be different for each application. The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD. Applicable if leakage occurs due to displacement of animal fodder
$F_{biogas,y}$ (m <sup>3</sup> /year)	Total amount of biogas collected in the outlet of the new digester in year $y$	Parameter monitored continuously but aggregated annually for calculations Flow meters will undergo maintenance/calibration subject to appropriate industry standards. The frequency of calibration and control procedures would be different for each application. This maintenance/calibration practice should be clearly stated in the CPA-DD. Applied to estimate emissions associated with physical leakage from the digester. When biogas is generated from solid materials in a Scenario 1 project, this is to be separately monitored as $F_{biogas,SM,y}$ but included in the total amount of biogas monitored for the purpose of determining physical

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		leakage and flaring emissions.
$F_{\text{biogas,SM,y}}$ (m <sup>3</sup> /year)	Amount of biogas collected in the outlet of the new digester that is generating biogas from solid materials only in year y	<p>Parameter monitored continuously but aggregated annually for calculations</p> <p>Flow meters will undergo maintenance/calibration subject to appropriate industry standards. The frequency of calibration and control procedures would be different for each application. This maintenance/calibration practice should be clearly stated in the CPA-DD.</p> <p>Only applicable for Scenario 1 type projects that include digestion of solid materials in the project scenario.</p> <p>Biogas generated from solid materials is to be separately monitored in order to discount the part of exported heat/power caused by digestion of solid materials. Total net exported heat/power shall be multiplied with a ratio <math>R_{\text{biogas,SM,y}}</math> in order to determine only the relevant amount of baseline heat/power emissions for calculation of emission reductions, where:</p> $R_{\text{biogas,SM,y}} = \frac{F_{\text{biogas,y}} \times w_{\text{CH4,biogas,y}} - F_{\text{biogas,SM,y}} \times w_{\text{CH4,biogas,SM,y}}}{F_{\text{biogas,y}} \times w_{\text{CH4,biogas,y}}}$
$w_{\text{CH4,biogas,y}}$ (kg CH <sub>4</sub> / m <sup>3</sup> )	Concentration of methane in the total biogas supply in the outlet of the new digester	<p>Either with continuous analyser or alternatively with periodical measurement at 95% confidence level</p> <p>The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD. The project proponents shall define the error for different levels of measurement frequency in the CPA-DD. The level of accuracy will be deducted from average concentration of measurement.</p>
$w_{\text{CH4,biogas,SM,y}}$ (kg CH <sub>4</sub> / m <sup>3</sup> )	Concentration of methane in the biogas in the outlet of the new digester that is generating biogas from solid materials only, in year y	<p>Either with continuous analyser or alternatively with periodical measurement at 95% confidence level</p> <p>The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD. The error for different levels of measurement frequency shall be defined. The level of accuracy will be deducted from average concentration of measurement.</p> <p>Used to determine <math>R_{\text{biogas,SM,y}}</math> in order to discount the heat/power generated by the solid materials. Although biogas created from the solid materials can be expected to be similar to biogas generated from the wastewater in terms of methane content, monitoring the methane content of the biogas of the solid materials is used to correct for any methane concentration fluctuations</p>
$\text{COD}_{\text{PJ,seim,y}}$ (t COD/year)	Amount of chemical oxygen demand lost through sedimentation in the lagoon or sludge pit under the project activity	<p>This parameter will be determined as per the sampling procedure provided in annex -2 of the applied methodology.</p> <p>The COD will be tested by an external accredited laboratory.</p>

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$FV_{RG,h}$ (Nm <sup>3</sup> /hour)	Biogas sent to flare, (Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour $h$ .)	Measured with a flow meter. Measured continuously and averaged hourly. Ensure that it is measured on the same basis (wet or dry) as the volumetric fraction. The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.
$fv_{i,h}$ -	Volumetric fraction of component $i$ in the residual gas in the hour $h$ where $i = CH_4$	Measured continuously with a gas analyser. Continuously using a gas analyser. Values to be averaged hourly or at a shorter time interval. 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 °C The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. A zero check and a typical value check should be performed by comparison with a standard certified gas. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD. As a simplified approach only the concentration of methane is measured and the remaining part is considered as N <sub>2</sub>
Other flare operation parameters – Flame detector (On/Off or numeric value indicating On/Off)	Detection unit	Measured continuously. The Sensor will be linked to the data logger linked up to an alarm. If the flame goes out, the shift leader/process operator will immediately attend and re-ignite the flame. If the flame is not re-ignited within 20mins, then the emission from that hour will not be included. The detector will be calibrated by the manufacturer and checked on a quarterly basis to ensure that it is operational and functioning correctly. Used for open flare, as per "Tool to determine project emissions from flaring gases containing Methane", Version 1.0, EB28. Used to demonstrate that the flare is operational (e.g. through a flame detection system reporting electronically on continuous basis)). If the flare is not operational for more than 20 mins the default value to be adopted for flare efficiency is 0%. This parameter is only relevant for open flares. In case of enclosed flared, the parameter $T_{flare}$ is used to indicate that the flare is operating.
$T_{flare}$ °C	Temperature in the exhaust gas of the flare	Measure the temperature of the exhaust gas stream in the flare by a Type N thermocouple. A temperature above 500 °C indicates that a significant amount of gases are still being burnt and that the flare is operating. Continuously. Thermocouples should be replaced or calibrated every year. Used for default efficiency for enclosed flare. An excessively high temperature at the sampling point (above 700 °C) may be an indication that the flare is not being adequately operated or that its capacity is not adequate to the actual flow.
Flare efficiency %	Flare efficiency of the flare	Use of the default factor for enclosed flare or open flare.
$EC_{PJ,y}$	Quantity of	Monitored continuously using electricity meters

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MWh	electricity consumed by the project electricity consumption sourced from the grid	The equipment will be calibrated in accordance with manufacturer's requirements or once per year if no guidelines are provided by the manufacturer. Equipment will be calibrated prior to or during installation. Additional QA/QC procedures may be defined for each individual CPA and described in the CPA-DD.
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It is to be noted that only the applicable monitoring parameters will be chosen from the exhaustive list in the PoA-DD and the same shall be selected on a case-by-case basis for the specific CPA and again validated by the contracted DOE during the CPA inclusion process. For 1<sup>st</sup> CPA, please refer to GLC's corresponding validation report.

Through document check and interview it can be confirmed that the monitoring plan described in PoA-DD provides sufficient information and is in compliance with the applied methodology and tools. All the monitoring arrangements are feasible within the overall PoA design and project participant's competence as per VVM paragraphs 122 – 124 <sup>/6/</sup>.

The monitoring plan is to be implemented to enable subsequent verification of emission reductions. The application of the monitoring methodology is transparent and it is the opinion of GLC that the CPA implementers will be able to implement the monitoring plan and the project's emission reductions would be able to be reported *ex-post* and verified.

## 4.7 PoA Duration and CPA Crediting Period

The starting date of the PoA has been clearly stated in the PoA-DD section B.1 as 31/12/2012 <sup>/36/</sup>. It is to be noted that the start date of the PoA crediting period is same i.e. 31/12/2012 (or on the date of registration, whichever is later). The start date of the PoA has been assessed as reasonably defined. It is highlighted that the 1<sup>st</sup> CPA start date is indicated as 15/09/2012 <sup>/37/</sup> which is yet to happen and after the start of validation of the PoA (GSC on 21/12/2011). The starting date of 1<sup>st</sup> CPA crediting period is stated as 15/09/2013 <sup>/37/</sup> (or the date of inclusion, whichever is later), which is also after the PoA crediting period start date; therefore is deemed appropriate. Validation team concludes that this anticipated start date of 1<sup>st</sup> specific CPA could reasonably be concluded as the earliest date at which either the implementation or construction or real action of the CPA begins, in accordance with glossary of CDM terms <sup>/20/</sup>.

The PoA duration is stated in the PoA-DD section B.2 as 28 years, 1<sup>st</sup> CPA crediting period is chosen as 7 years <sup>/37/</sup> (may be renewed twice). This is deemed appropriate.

## 4.8 Baseline and Monitoring Methodology

### 4.8.1 Applicability of the Selected Methodology to a typical CPA

Through document check and background research, it is verified that the project has applied valid versions of an approved consolidated baseline and monitoring methodology as well as approved CDM tools: ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" version 04.1.0 <sup>/2/</sup>, Tool for the demonstration and assessment of additionality" (hereafter referred to as

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“additionality tool”), version 06.0.0 <sup>/5/</sup>, “Tool to determine project emissions from flaring gases containing methane” (hereafter referred to as “the flaring tool”, version 1 <sup>/4/</sup>, “Tool to calculate the emission factor for an electricity system” (hereafter referred to as “the EF tool”), version 02.2.1 <sup>/7/</sup>, “Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion”, version 02 <sup>/8/</sup> and Tool to calculate baseline, project and/or leakage emissions from electricity consumption, Version 1 <sup>/10/</sup>. GLC has checked the final PoA-DD <sup>/36/</sup> and assessed that all applicability criteria as listed therein (as demonstrated in table below) are complete and deemed completely verifiable.

Each CPA will be assessed, as part of the eligibility criteria for inclusion in the PoA, against the relevant applicability conditions stipulated by the methodology and tools as outlined in the PoA-DD <sup>/36/</sup>. This shall be validated by the contracted DOE during CPA inclusion. For 1<sup>st</sup> CPA, please refer to GLC’s corresponding validation report.

Table 4.7-1: Applicability conditions of the applied methodology and tools and CME's justification:

Ref No.	Applicability conditions of the ACM0014 (version 04.1) <sup>1/2/</sup>	CMEs Justification
1	<p>The methodology is applicable to the scenarios described in Table 1 of the methodology. The description of the baseline situation and project activity for each CPA shall conform to SCENARIO (1) of the methodology.</p>	<p><b><u>SCENARIO 1</u></b>  <b>Description of the Baseline Situation (Scenario 1):</b> The wastewater is not treated, but directed to open lagoons that have clearly anaerobic conditions. In cases where solid materials are separated before directing the wastewater to the open lagoons, the solid materials have a different treatment than the wastewater.  The description of the baseline will be confirmed by the CME to be in accordance with Scenario 1 through review of the open lagoons design drawings from the existing facility and physical inspection of the lagoons (evidenced by photos showing the anaerobic conditions, i.e. methane bubbles). In the case of Greenfields projects, the proposed site will be inspected to confirm that an existing facility does not exist and the procedure for the identification of the most plausible baseline scenario in ACM0014 as outlined in Section E.4 will be applied. In the case that any solid materials are separated before directing the wastewater to open lagoons the presence of a different treatment process will be confirmed through inspection.  <b>Description of the Project Activity (Scenario 1):</b> In a typical CPA, the wastewater is treated in a new anaerobic digester. In cases where solid materials are separated from the wastewater (both in the project and baseline scenarios), they will be treated separately and not treated with the new anaerobic digester employed for treatment of liquid effluents. The biogas extracted from the anaerobic digester and, if applicable, biogas generated from the treatment of solid materials, is flared and/or used to generate electricity and/or heat. The residual from the anaerobic digester, after treatment, is directed to open lagoons or is treated under clearly aerobic conditions (e.g. dewatering and land application).  The description of the project will be recorded in the CPA-DD and confirmed by the CME to be in accordance with Scenario 1 through the project design drawings of the anaerobic digester and, if the project has started, the purchase orders of equipment required to construct the anaerobic digester.</p>

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2	The average depth of the open lagoons or sludge pits in the baseline scenario is at least 1 m.	A typical CPA project site will have open lagoons exceeding 1m (including the most likely pond design identified for Greenfields projects). This is consistent with TBEC's existing four CDM projects. This will be confirmed by the CME through review of the open lagoons design drawings from the existing facility and physical inspection of the lagoons (evidenced by photos showing the measurement of the depth of the open lagoons). In the case of Greenfields projects, the procedures explained in the section "Identification of alternative scenarios" of the methodology ACM0014 shall be applied.
3	Heat and electricity requirements per unit input of the water treatment facility remain largely unchanged in the baseline scenario and the project activity;	A typical CPA will not alter existing wastewater treatment facilities but instead install a new biogas system as described in criteria #1 above. The baseline scenario is the use of open lagoons that have clearly anaerobic conditions. As such, the heat and electricity requirements of the existing system (open anaerobic lagoons) will remain largely unchanged because such systems typically utilize small amounts of electricity for pumps. Equipment installed under the project scenario which is required for the capture, treatment and utilization of biogas is not part of the water treatment process. Electricity requirements of the existing wastewater facility will be determined from design drawings (if available) or alternatively from the specifications of the existing equipment (i.e. pumps). Electricity requirements of the wastewater treatment system installed as part of the project activity will be determined from process design drawing and equipment specifications. From these documents it will be determined that the heat and electricity requirements per unit input of the water treatment facility remain largely unchanged.
4	Data requirements as laid out in the methodology (ACM0014) are fulfilled.	The CME will co-ordinate the collection of all necessary data requirements as laid out in ACM0014. Data from each CPA project site and where relevant public data sources will be recorded in the CPA-DD. Original documents including but not limited to: test reports, design drawings, equipment specifications, financial records, board minutes, purchase orders and equipment contracts will be retained in the CME filing system in soft copy format in an electronic filing system managed by the CME.

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5	For Scenario 1, the following applies: The residence time of the organic matter in the open lagoon system should be at least 30 days;	Open lagoons at a typical CPA project site will exceed the 30 days residence time. This will be checked through use of the open lagoon design drawings (or on-site measurements of the lagoons where drawings are unavailable). The volume of the open lagoon system and the wastewater flow rate into the open lagoon system will be used to calculate the residence time. This is consistent with TBEC's existing four CDM projects.
6	For Scenario 1, the following applies: Local regulations do not prevent discharge of wastewater in open lagoons.	In Thailand local regulations do not prevent discharge of wastewater into open lagoons. Notification No. 2 of the Thai Ministry of Industry (B.E. 2539) regarding wastewater from industrial factory does not prevent discharge of wastewater into open lagoons.
7	For Scenario 1, the following applies: Inclusion of solid materials in the project activity is only applicable where: (i) Such solid materials are generated by the industrial facility producing the wastewater, and (ii) The solid materials would be generated both in the project and in the baseline scenario.	A typical CPA will only include solid materials where: (i) Such solid materials are generated by the industrial facility producing the wastewater, and (ii) The solid materials would be generated both in the project and in the baseline scenario. The design of the CPA project activity (substantiated from the technology process flow diagram) will be utilised to demonstrate whether solid materials are included in the process design. Any solid materials indicated for use in the process flow diagram will be confirmed to be: (i) Generated by the industrial facility producing the wastewater through onsite observation of the process equipment and photographic evidence, (ii) The solid materials would be generated both in the project and in the baseline scenario through review of both the project process design and the existing facility design. Data described above will be recorded in the CPA-DD. Original design documents will be retained in the CME filing system in soft copy format in an electronic filing system managed by the CME.
Tool for the demonstration and assessment of additionality <sup>5/</sup>		
8	Applicable geographical area covers the entire host country as a default; if the technology applied in the project is not country specific, then the applicable geographical area should be extended to other countries. Project participants may provide justification that the applicable geographical area is smaller than the host country for technologies that vary considerably from location to location depending on local conditions.	A typical CPA will employ technology that is applicable to the entire host country of Thailand. National regulations in Thailand (i.e. Thailand Industrial Work Department Limitations on Wastewater Discharge) are applicable on a national basis. Hence, the applicable geographic area applies to the entire host country as a default.

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9	<p>Measure (for emission reduction activities) is a broad class of greenhouse gas emission reduction activities possessing common features. Four types of measures are currently covered in the framework:</p> <p>(a) Fuel and feedstock switch;</p> <p>(b) Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies);</p> <p>(c) Methane destruction;</p> <p>(d) Methane formation avoidance.</p>	<p>A typical CPA will involve technology which achieves measure (c) methane destruction. This is consistent with TBEC's existing four CDM projects. The CME will confirm that the project involves methane destruction through the project design drawings of the anaerobic digester and, if the project has started, the purchase orders of equipment required to construct the anaerobic digester.</p>
10	<p>This tool does not replace the need for the baseline methodology to provide a step-wise approach to identify the baseline scenario. Project participants that propose new baseline methodologies shall ensure consistency between the determination of additionality of a project activity and the determination of a baseline scenario. Project participants can also use the combined tool to identify the baseline scenario and demonstrate additionality.</p>	<p>ACM0014 includes a baseline methodology to provide a step-wise approach to identify the baseline scenario and this will be applied and recorded in the CPA-DD for each specific project activity.</p>
<b>Tool to determine project emissions from flaring gases containing methane<sup>4/</sup></b>		
11	<p>This tool is applicable under the following conditions:</p> <ul style="list-style-type: none"> <li>• The residual gas stream to be flared shall be obtained from decomposition of organic material (through landfills, bio-digesters or anaerobic lagoons, among others) or from gases vented in coal mines (coal mine methane and coal bed methane).</li> </ul>	<p>A typical CPA will involve methane rich biogas from anaerobic wastewater treatment, as such:</p> <ul style="list-style-type: none"> <li>• The residual gas stream to be flared will be obtained from decomposition of organic material (through anaerobic lagoons). The CME will confirm this through review of the project design drawings indicating that the flare is supplied with a gas stream originating from the decomposition of organic material.</li> </ul>
<b>Tool to calculate the emission factor for an electricity system<sup>7/</sup></b>		
12	<p>This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).</p>	<p>A typical CPA will install a new anaerobic digester for treatment of industrial wastewater and, if applicable, the treatment of solid materials. The biogas generated is flared and/or used to generate electricity and/or heat. CPAs which generate electricity from the destruction of methane for sale to the Thai electricity grid will apply the Tool to calculate the emission factor for an electricity system. The CME will confirm this through the design drawings of the project and: (a) if the project sells electricity to the grid, a review of the Power Purchase Agreement (if already available) for sale of electricity to the grid. (b) In the case that the project supplies electricity to a user that would otherwise be provided by the grid, review of electricity purchase receipts and/or physical inspection of the grid</p>

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		connection will be performed. For Greenfields projects, a review of design drawings will be conducted.
13	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, the conditions specified in "Annex 2 - Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10% of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10% of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	A typical CPA will be implemented in Thailand. The emission factor for Thailand electricity system is calculated for grid power plants only. This will be confirmed through the documentation for the Thailand emissions factor released by the Thailand DNA, and if not available, through emissions factor calculation as per methodological choice and equation outlined in Section E.6.2.
14	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	A typical CPA will be implemented in Thailand. The Thailand grid is not located partially or totally in an Annex I country.
<b>Tool to calculate baseline, project and/or leakage emissions from electricity consumption<sup>10/</sup></b>		
15	<p>The tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption:</p> <p>Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any on-site captive power plant exists, it is not operating or it can physically not provide electricity to the source of electricity consumption.</p> <p>Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.</p> <p>Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumption</p>	As per Scenario A, a typical CPA will consume electricity from the grid as either a primary electricity source or as a backup supply to the biogas generator installed as part of the project activity. The CME will confirm this through review of the project design drawings and through inspection of the project site to confirm that a grid connection is possible at the project site.

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	source. The captive power plant(s) can provide electricity to the electricity consumption source. The captive power plant(s) is/are also connected to the electricity grid.	
16	This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO <sub>2</sub> emissions.	A typical CPA will not involve captive renewable power generation technologies as a typical CPA will have a connection to the national grid. The CME will confirm this through inspection of the project site to confirm availability of the grid connection.
<b>Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion<sup>/8/</sup></b>		
17	This tool provides procedures to calculate project and/or leakage CO <sub>2</sub> emissions from the combustion of fossil fuels. It can be used in cases where CO <sub>2</sub> emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties.	A typical CPA will not combust fossil fuels and the procedures in the Tool will not be required. In the case that a CPA must combust fossil fuels then the CO <sub>2</sub> emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties.

The results of the compliance and completeness check are detailed in Annex A of the validation report. All applicability conditions of the applied methodology/tools have been demonstrated and the PoA design is in line with all requirements and stipulations mentioned in all sections of the applied methodology/tools.

The applicability of the selected methodology has been included in the list of eligibility criteria as required according to the Validation and Verification Manual <sup>/6/</sup> paragraph 167 which states that eligibility criteria should “...include inter alia the means of demonstrating ...the applicability of the applied methodology”. The justification provided by the CME and the suggested list of evidence for the same have been assessed as completely verifiable.

Besides, emission sources, which are not addressed by the applied methodology, and are expected to contribute more than 1% of the overall expected annual average emission reductions, have not been identified. This PoA therefore fulfils all the applicability criteria of the applied methodology and the tools therein.

## 4.8.2 Project Boundary

As presented in the PoA-DD <sup>/36/</sup>, the spatial boundary of a typical CPA is comprised of the following elements: (a) the anaerobic digester, (b) the treatment system which receives effluent form the digester, (c) the final discharge location of effluent (d) the equipment associated with production, collection cleaning and distribution of biogas, (e) the equipment associated with destruction and gainful use of

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biogas, and (f) equipment used to supply electricity/energy to the project equipment. If the CPA includes solid materials that are part of the waste stream within the project boundary, no baseline emissions (either for the methane avoidance or for any energy generation) is accounted for in the baseline scenario. If the CPA involves the sale of electricity to the national electricity grid system, the grid system will also be included in the spatial boundary. Validation team confirms that the spatial boundary description is in line with applied methodology <sup>/2/</sup>.

A transparent description of the GHG sources is also presented in the PoA-DD <sup>/36/</sup> which is assessed as being inline with the applied methodology <sup>/2/</sup>. The same is also presented below:

	Source	Gas		Justification / Explanation
Baseline	Wastewater treatment processes or sludge disposal	CH <sub>4</sub>	Included	The major source of emissions in the baseline from open lagoons (Scenario 1). Any methane emissions from solid materials are not accounted for in baseline scenario.
		N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative
		CO <sub>2</sub>	Excluded	CO <sub>2</sub> emissions from the decomposition of organic waste are not accounted for
	Electricity consumption / generation	CO <sub>2</sub>	Included	Electricity may be consumed for the operation of the wastewater system in the baseline scenario. If electricity is generated with biogas from an anaerobic digester under the project activity, electricity generation in the grid or on-site is displaced by the project activity. Any electricity generated from solid materials will be excluded from baseline. Each CPA will be assessed on a case by case basis in the CPA-DD to determine if this is an applicable emissions source.
		CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative
		N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative
	Thermal energy generation	CO <sub>2</sub>	Included	If thermal energy is generated with biogas from an anaerobic digester under the project activity, on-site thermal energy generation is displaced by the project activity. Any heat generated from solid materials will be excluded from baseline. Each CPA will be assessed on a case by case basis in the CPA-DD to determine if this is an applicable emissions source.
		CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative
		N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative

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	Source	Gas		Justification / Explanation
Project Activity	Wastewater treatment processes or sludge treatment process	CH <sub>4</sub>	Included	The treatment of wastewater or sludge under the project activity may cause different emissions, each CPA will be assessed on a case by case basis in the CPA-DD to determine which of the following are applicable emissions sources: (i) Methane emissions from the lagoons (if effluent from the treatment under the project activity is directed to lagoons); (ii) Physical leakage of methane from the digester system; (iii) Methane emissions from flaring (if biogas from the digester is flared); (iv) Methane emissions from land application of wastewater/sludge; (v) Methane emissions from wastewater removed in the dewatering process
		CO <sub>2</sub>	Excluded	CO <sub>2</sub> emissions from the decomposition of organic waste are not accounted for
		N <sub>2</sub> O	Included	Included in case of projects that involve land application of sludge. Each CPA will be assessed on a case by case basis in the CPA-DD to determine if this is an applicable emissions source.
	On-site electricity use	CO <sub>2</sub>	Included	May be an important emission source. If electricity is generated with biogas from an anaerobic digester, these emissions are not accounted for. Any on-site electricity consumption should be subtracted from the electricity generation of the digester. Each CPA will be assessed on a case by case basis in the CPA-DD to determine if this is an applicable emissions source.
		CH <sub>4</sub>	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N <sub>2</sub> O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	On-site fossil fuel consumption	CO <sub>2</sub>	Included	May be an important emission source. Each CPA will be assessed on a case by case basis in the CPA-DD to determine if this is an applicable emissions source.
		CH <sub>4</sub>	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N <sub>2</sub> O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

The boundary of each CPA shall be defined in the CPA-DD and this shall be validated by the contracted DOE during CPA inclusion. For 1<sup>st</sup> CPA, please refer to GLC's corresponding validation report.

Further, it is to be noted that at commencement of the PoA, the physical boundary is the national borders of Thailand. All applicable national and/or sectoral policies and regulations of each host country within the chosen boundary have been taken into consideration and deemed in compliance with the design of the PoA.

It should also be highlighted that the validation team has assessed the explanation in the PoA-DD <sup>/36/</sup> that the “Adder” provision is “E-minus” policy to be excluded from consideration in the investment analysis, as reasonable and can be accepted with explanation as follows: To promote renewable energy, through the National Energy Policy Council (NEPC), the Thai government has on 04/09/2006 approved the framework of a supportive scheme, “Adder” provision which is an additional electricity tariff on top of the normal prices, that renewable energy-based power producers under the Small Power Producer (SPP) and Very Small Power Producer (VSPP) programme can receive when selling electricity to the grid <sup>/29/</sup>. The Adder provision was later suggested by Thailand’s Ministry of Energy on 17/10/2006 as should be categorised according to the different renewable energy (feedstock) fuels use to generate electricity, and was later formulated accordingly by the Energy Policy Council (EPC) on 20/11/2006 <sup>/29/</sup>. It is noted that the Adder provision was eventually approved by the NEPC on 04/12/2006 firstly for the VSPP programme, which was officially announced by the PEA on 01/02/2007 <sup>/29/</sup>. The amounts of adder (additional tariff), as already mentioned, vary depending on the technology used, but currently for biogas based technologies in normal (and not underdeveloped zone), adder is given at 0.3 THB/kWh in acknowledgement of their investment barrier. In accordance with Annex 3 of EB22 meeting report, it has been assessed and verified, through our local expertise and review of publically available information that the Adder Provision could be considered as ‘E-minus policy’ as it can clearly be regarded as national and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies. Crucially though, it is highlighted that the Adder policy has been implemented after the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001). With this, the validation team can conclude as acceptable to regard Adder provision as E- policy in accordance with para 7(b) of EB22, Annex 3 <sup>/35/</sup>. It is further noted that footnote 11 of the additionality tool <sup>/5/</sup> requires the consideration of EB guidance on national/local/sectoral policies and measures for the baseline setting, hence based on the argument outlined above, the validation team concluded that the exclusion of Adder in the investment analysis has been duly justified based on relevant provisions in the additionality tool and CDM EB decision on treatment of national policies (EB22 Annex 3) and will be reflected in the investment analysis for CPAs in the development of CPA-DD for each activity.

### 4.8.3 Baseline Identification of a typical CPA

Through interview and review of documents, GLC has verified that the baseline scenario of the CPAs is/will be identified according to the methodology <sup>/2/</sup> in compliance with the VVM <sup>/6/</sup>. Details on the baseline determination approach and GLC’s assessment are provided as below:

As prescribed by the methodology ACM0014 version 04.1 <sup>/2/</sup> identification of the most plausible baseline scenario is determined through the following four steps which will be applied individually in all CPAs.

Step 1: Identification of alternative scenarios

Step 2: Eliminate alternatives that are not complying with applicable laws and regulations

Step 3: Eliminate alternatives that face prohibitive barriers

Step 4: Compare economic attractiveness of remaining alternatives

#### Assessment of Step 1: Identification of alternative scenarios

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PoA-DD <sup>/36/</sup> transparently includes the list of plausible alternative scenarios for the treatment of wastewater as below, in line with that suggested by the applied methodology <sup>/2/</sup>:

- W1: The use of open lagoons for the treatment of the wastewater;
- W2: Direct release of wastewaters to a nearby water body;
- W3: Aerobic wastewater treatment facilities (e.g., activated sludge or filter bed type treatment);
- W4: Anaerobic digester with methane recovery and flaring;
- W5: Anaerobic digester with methane recovery and utilization for electricity or heat generation;
- W6: Wastewater is directed to land application without dewatering;
- W7: Wastewater is dewatered and directed to land application/used as fuel in energy applications.

For project activities implemented in Greenfield facilities, the specifications of the W1 scenario will be defined in the CPA-DD following four steps as per the applied methodology ACM0014 version 04.1:

(a) Define several lagoon design options for the particular wastewater stream that meet the relevant regulations and take into consideration local conditions (e.g. environmental legislation, ground water table, land requirement, temperature). Design specifications shall include average depth and surface area of the lagoon, electricity consumption ( $EC_{BL}$ ), residence time of the organic matter and effluent adjustment factor ( $AD_{BL}$ ), as well as any other key parameters. Document the different design options in a transparent manner and provide transparent and documented evidence of key assumptions and data used, and offer conservative interpretations of this evidence;

(b) Carry out an economic assessment of the identified options, as per the guidance under Step 4 below. Choose the least cost lagoon design option from the options defined in Step 1 taking into account all relevant local conditions (e.g. land requirements, land prices, ground water level). If several options with comparably low costs exist, choose the one with the lowest lagoon depth as the baseline lagoon design;

(c) Verify the average depth of the baseline lagoon design, as determined in Step (b), based on a review of published literature establishing an average lagoon depth for a particular industry (particular type of waste water). If such literature does not exist, conduct a survey within the industry based on a control group of the five most recently constructed lagoon systems in the particular industry;

(d) If the average depth of the lagoon design option identified in Step (b) is deeper than the depth identified through literature review or the control group in Step (c), provide credible explanations why the assumptions of the least cost design are valid. The explanations have to be supported by credible evidences that the depth identified in Step (c) is not a feasible option for the project activity. Provide transparent and documented evidence, and offer conservative interpretations of this evidence.

The approach for Greenfield projects is assessed by GLC as being in accordance with that prescribed by the applied methodology <sup>/2/</sup>

Further, the PoA-DD <sup>/36/</sup> indicated that if the project activity includes electricity generation with biogas from a new anaerobic digester, plausible alternative scenarios for the generation of electricity should be determined. These may include, but are not limited to, the following:

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- E1: Power generation using fossil fuels in a captive power plant;
- E2: Electricity generation in the grid;
- E3: Electricity generation using renewable sources.

The indicative list of plausible alternatives for electricity generation is assessed by GLC as having been reasonably defined, in line with the methodology <sup>/2/</sup> as well as the scope of the PoA.

If the project activity includes heat generation with biogas from a new anaerobic digester, plausible alternative scenarios for the generation of heat should be determined. These may include, but are not limited to, the following:

- H1: Co-generation of heat using fossil fuels in a captive cogeneration power plant;
- H2: Heat generation using fossil fuels in a boiler;
- H3: Heat generation using renewable sources.

The indicative list of plausible alternatives for heat generation is assessed by GLC as having been reasonable defined, in line with the methodology <sup>/2/</sup> as well as the scope of the PoA.

In case of Scenario 1, plausible alternative scenarios for the treatment of solid materials (SM), if applicable, should be determined. These may include, but not limited to, the following:

- SM1: The solid materials are dumped or left to decay under anaerobic or aerobic conditions;
- SM2: The solid materials are used as animal fodder;
- SM3: The solid materials are burnt in an uncontrolled manner without utilizing it for energy purposes;
- SM4: The solid materials are burnt for energy purposes.

The indicative list of plausible alternatives for treatment of solid material is assessed by GLC as having been reasonable defined, in line with the methodology <sup>/2/</sup> as well as the scope of the PoA.

## Assessment of Step 2: Eliminate alternatives that are not complying with applicable laws and regulations

In accordance with the applied methodology <sup>/2/</sup>, GLC has assessed that the PoA-DD <sup>/36/</sup> has correctly stated that the PoA and each CPA will follow procedures to eliminate alternatives that are not in compliance with applicable legal and regulatory requirements in accordance with Sub-step 1b of the additionality tool <sup>/5/</sup>.

With the available local expertise of the team member, validation team has reviewed the alternatives with respect to all the local legal and regulatory requirements. As per Thai regulations, it is illegal to directly discharge untreated wastewater from factories (as per Thailand Industrial Ministry Announcement, 2nd Issued (B.E.2359), Refers to Factory Act 2535, Subject: Attributes of Wastewater from Factory <sup>/25/</sup>). It is noted that regardless of the end-use of wastewater (whether it is directly released to water bodies or applied to land with or without dewatering), the wastewater must be treated before discharge. Therefore it is confirmed that the alternative scenarios W2, W6 and W7 which involve the release of untreated wastewaters from the factory are not in compliance with the Thai regulations and therefore can be eliminated directly as per the prevailing regulations.

Moreover, it is confirmed that the use of open lagoons is in compliance with local regulations, and it is not mandatory to use specific technologies (e.g. open lagoons, aerobic and anaerobic wastewater treatment with biogas collection and combustion/utilization). In other words, local regulations only require treatment of wastewater, and so long as the implemented technologies are able to treat wastewater to the specified standards, they can all be used. Thus, it can be confirmed that there is no legal barrier to alternatives W1, W3, W4 and W5.

However, as stated, alternative scenarios W2, W6 and W7 do not comply with applicable laws and regulations and have therefore been assessed as having been correctly eliminated in the PoA-DD <sup>/36/</sup> and will not be considered further.

It is also confirmed that the scenarios for electricity, heat or solid materials are complying with applicable laws and regulations and do not face any legal or regulatory restrictions. Therefore, the remaining scenarios after step 2 are:

W1: The use of open lagoons for the treatment of the wastewater;  
W3: Aerobic wastewater treatment facilities (e.g., activated sludge or filter bed type treatment);  
W4: Anaerobic digester with methane recovery and flaring;  
W5: Anaerobic digester with methane recovery and utilization for electricity or heat generation.

E1: Power generation using fossil fuels in a captive power plant;  
E2: Electricity generation in the grid;  
E3: Electricity generation using renewable sources.

H1: Co-generation of heat using fossil fuels in a captive cogeneration power plant;  
H2: Heat generation using fossil fuels in a boiler;  
H3: Heat generation using renewable sources.

SM1: The solid materials are dumped or left to decay under anaerobic or aerobic conditions;  
SM2: The solid materials are used as animal fodder;  
SM3: The solid materials are burnt in an uncontrolled manner without utilizing it for energy purposes;  
SM4: The solid materials are burnt for energy purposes.

The elimination of alternatives that are not complying with applicable laws and regulations in context of the PoA has been assessed as having been reasonably and correctly demonstrated. Nonetheless, it should be noted that this step shall be performed again in the CPA-DD taking into account the specific conditions of each CPA.

## Assessment of Step 3: Eliminate alternatives that face prohibitive barriers:

In accordance with the applied methodology <sup>/2/</sup>, it is assessed that the PoA-DD <sup>/36/</sup> has correctly stated that the PoA and each CPA shall apply Step 3 of the latest version of the additionality tool <sup>/5/</sup> for the elimination of alternatives that face prohibitive barriers. Further assessment is provided as below.

In accordance with sub-step 3a of the additionality tool <sup>/5/</sup> 'Identify barriers that would prevent the implementation of the proposed CDM project activity', CME has established and illustrated the realistic and credible barriers preventing the implementation of the CPA without CDM. It is noted that as per guidance provided in the additionality tool <sup>/5/</sup>, "*such realistic and credible barriers may include, among others, Investment barriers, Technological Barriers, Barriers due to prevailing practice inter alia, the project activity is the "first of its kind" or other barriers relevant to the project*".

In the PoA-DD <sup>/36/</sup> it is stated that scenario W3 may be eliminated due to technological barrier of technological failure risk, as the process/technology failure risk of aerobic treatment is significantly greater than for other comparable technologies. The same has been substantiated by relevant scientific literature that indicates the COD of high strength industrial organic rich wastewater is far too high to treat in aerobic process (see E. Roberts Alley, 'Water Quality Control Handbook 2007', page 10.65) <sup>/24/</sup>. The elimination of W3 scenario was further argued on ground that aerobic treatment systems are more complicated due to inherent difficulties like oxygen transfer problem, high waste sludge produces and settling problem (see Francisco J. Cervantes et al., 'Advanced biological treatment processes for industrial wastewaters, Principles and Applications', page 259) <sup>/23/</sup>. It is assessed that the stated barrier is credible and in line with our local knowledge that aerobic treatment plant is not common in Thailand for primary treatment of high COD industrial wastewater, and if adopted, would normally be used as secondary treatment system (e.g. after the wastewater is treated in open anaerobic lagoons). The cited barriers are assessed as technology specific and being inherent to the nature of the high strength industrial organic rich wastewater. Hence, it is deemed as reasonable for the elimination of W3 scenario in that their failure risk in the local- and and PoA-specific circumstances is significantly greater than for other technologies for treatment of industrial wastewater (e.g. open anaerobic lagoons). It is further noted that the use of the above-cited references is also in compliance with that required by the additionality tool (i.e. relevant scientific literature or technology manufacturer information) and deemed to be of reputed sources, which can be used as evidence of the presence of the barrier for other project(s) under similar circumstances. Hence, the same has been deemed as representing objective demonstration of barrier in accordance with EB50 Annex 13 <sup>/13/</sup>. It is noteworthy that this barrier cannot be avoided considering the financial/technical capacity of the companies involved; the nature of the wastewater stream to be treated cannot be mitigated by additional financial means.

The remaining wastewater scenarios that may be eliminated depending on the specific details of each CPA site are therefore correctly identified as:

- W1. The use of open lagoons for the treatment of the wastewater;
- W4: Anaerobic digester with methane recovery and flaring;
- W5. Anaerobic digester with methane recovery and utilization for electricity or heat generation

The scenarios for electricity, heat and solid materials that face prohibitive barriers will depend on the specific details of each CPA site. It is noted that as per the PoA-DD <sup>/36/</sup>, the same shall be demonstrated in the CPA-DD for each CPA.

Nonetheless, the technology barrier may be faced for electricity generation at each CPA site depending on the following indicative list of potential barriers related to site details, among others:

- Sites which do not contain a captive power plant (but instead have a grid connection) will face barriers to power generation using fossil fuels (E1);

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- Remote sites which do not have access to grid connections will face a technology barrier to accessing electricity from the grid (E2);
- Sites which do not contain sources of renewable energy will face the technology barrier to accessing electricity generation from renewable sources (E3).

Similarly, the technology barrier may be faced for heat generation at each CPA site depending on the following indicative list of potential barriers related to site details, among others:

- Sites which do not contain a captive cogeneration power will face barriers to co-generation of heat using fossil fuels (H1);
- Sites which do not contain fossil fuel boilers will face barriers to heat generation in fossil fuel boilers (H2);
- Sites which do not contain renewable energy boilers will face barriers to heat generation in fossil fuel boilers (H3);

Plausible baseline scenarios for the use of solid material will depend on the technology employed at the industrial site, the configuration for treating wastewater/solid material in the baseline, the existence and proximity to markets for solid material and other site specific details. The barriers may be faced by each CPA sites for each scenario of solid material use depending on the site details as follows:

- Sites which do not include technology configured to remove solid materials from the wastewater will face the technology barrier to the solid materials being dumped or left to decay under anaerobic or aerobic conditions (SM1);
- Sites which do not include technology configured to remove solid materials from the wastewater will face the technology barrier to solid materials being used as animal fodder (SM2);
- Sites which do not include technology configured to remove solid materials from the wastewater will face the technology barrier to solid material being burnt in an uncontrolled manner without utilizing it for energy purposes (SM3);
- Sites which do not include technology configured to remove solid materials from the wastewater will face the technology barrier to solid materials being burnt for energy purposes (SM4);

Application of Step 3 will be applied for each CPA taking into account site specific details. If only one alternative remains, this can be considered the baseline for W, E, H and SM. If more than one alternative remains after step 3, then Step 4 must be applied.

## Assessment of Step 4: Compare economic attractiveness of remaining alternatives:

During the document review, it is assessed that that PoA-DD <sup>/36/</sup> correctly includes the requirements of step 4, 'Procedure for the identification of the most plausible baseline scenario' of the applied methodology <sup>/2/</sup>.

With reference to the same, the following parameters should be explicitly documented in the CPA-DD:

- Land cost;
- Engineering, Procurement and Construction cost;
- Labour cost;

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- Operation and Maintenance cost;
- Administration cost;
- Fuel cost;
- Capital cost and interest;
- Revenue from electricity sales;
- All other costs of implementing the technology of the each alternative option;
- All revenues generated by the implementation of the proposed technology except for carbon credits revenues (including energy savings due to captive use of biogas as fuel for either electricity or heat generation at the project site).

In the case that there are several alternatives remaining after Step 2 and that at least two alternatives are associated with costs, an investment comparison analysis should be conducted. In doing so, the PoA-DD <sup>/36/</sup> has stipulated that the IRR (or equivalent financial indicator) should be compared between the different alternatives and select the most cost-effective alternative (e.g. with the highest IRR) as the baseline scenario. Sensitivity analysis should also be performed by applying Sub-step 2d of the additionality tool <sup>/5/</sup>. The investment comparison analysis provides a valid argument that the most cost-effective scenario is the baseline scenario if it consistently supports (for a realistic range of assumptions) this conclusion. In case the sensitivity analysis is not fully conclusive, select the baseline scenario alternative with least emissions among the alternatives that are the most economically attractive according to the investment analysis and the sensitivity analysis.

Further, the PoA-DD <sup>/36/</sup> further state that if the project undertaken without being registered as a CDM project activity is the only remaining alternative with associated costs, a benchmark analysis is to be used to demonstrate its profitability or non-profitability.

If the project is profitable, it is to be considered as the baseline scenario. If not, the continuation of the current situation is the baseline.

It is reiterated that as per the PoA-DD <sup>/36/</sup>, a baseline scenario shall be established on a project specific basis for each CPA. Depending on the specific site details of each CPA, the relevant baseline scenarios for the electricity generation (where applicable), heat generation (where applicable), use of solid material (where applicable) and treatment of sludge (where applicable) will be identified in the CPA-DD, reviewed by the CME as part of the CPA inclusion process, and further cross-checked by the contracted DOE during validation. For 1<sup>st</sup> CPA, please refer to GLC's corresponding validation report.

All the above description is in line with the applied methodology <sup>/2/</sup> and deemed complete as well as appropriate for the determination of baseline scenario for each CPA.

Hence, through interview and review of documents, it has been verified that the baseline scenario is/will be identified according to the methodology; and in regard to item 87 of VVM <sup>/6/</sup>. GLC hereby confirms the following statements:

- a) All the assumptions and data used by the project participants are listed in the PoA-DD, including their references and sources;
- b) All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PoA-DD;

- c) Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable;
- d) Relevant national and/or sectoral policies and circumstances are considered and listed in the PoA-DD;
- e) The approved baseline methodology has been correctly applied to identify the most reasonable baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

## 4.8.4 Algorithms and Formulae used to Determine Emission Reductions

Assessment according to the requirement outlined in para 89 of the VVM <sup>/6/</sup> are described below.

The approved consolidated baseline and monitoring methodology applied for a typical CPA is ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" version 04.1.0 <sup>/2/</sup>. The following tools are also referenced in the applied methodology <sup>/2/</sup>: "Tool to determine project emissions from flaring gases containing methane (Version 1)" <sup>/4/</sup>, Tool to calculate the emission factor for an electricity system<sup>/7/</sup> (Version 2.2.1), Tool to calculate baseline, project and/or leakage emissions from electricity consumption<sup>/10/</sup> (Version 1) and Tool to calculate project or leakage CO2 emissions from fossil fuel combustion <sup>/8/</sup> (Version 2).

All methodological choices listed in the methodology/tools as described in the PoA-DD <sup>/36/</sup> will be available to the implementers of the individual CPAs and these methodological choices will be selected in accordance with the specific site details and technology of the relevant CPA. It is noted that the methodological choices used to determine the calculation methods for baseline, project and leakage emissions will be applied on a case by case basis to each CPA depending on the baseline scenario, project design and technology details for each CPA.

The PoA-DD <sup>/36/</sup> applies steps and equations to calculate project emissions, baseline emissions, leakage and emission reductions as per the requirements of the applied methodology and tools.

Following equations are considered as relevant for the scope of the PoA:

### Baseline Emission of a typical CPA:

As per ACM0014 version 04.1 <sup>/2/</sup>, baseline emissions are calculated as follows:

$$BE_y = BE_{CH_4,y} + BE_{EL,y} + BE_{HG,y}$$

Where:

- $BE_y$  = Baseline emissions in year y (tCO<sub>2</sub>e/yr)
- $BE_{CH_4,y}$  = Methane emissions from anaerobic treatment of the wastewater in open lagoons (Scenario 1) in the absence of the project activity in year y (tCO<sub>2</sub>e/yr)
- $BE_{EL,y}$  = CO<sub>2</sub> emissions associated with electricity generation that is displaced by the project activity and/or electricity consumption in the absence of the project activity in year y (tCO<sub>2</sub>/yr)
- $BE_{HG,y}$  = CO<sub>2</sub> emissions associated with fossil fuel combustion for heating equipment that is displaced by the project in year y (tCO<sub>2</sub>/yr)

Therefore, the baseline emissions are calculated in three steps as follows:

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- Step 1: Calculation of baseline emissions from anaerobic treatment of the wastewater ( $BE_{CH_4,y}$ );  
Step 2: Calculation of baseline emissions from generation and consumption of electricity ( $BE_{EL,y}$ );  
Step 3: Calculation of baseline emissions from heat generation ( $BE_{HG,y}$ );

## Step 1: Calculation of baseline emissions from anaerobic treatment of the wastewater

The methodology proposes two alternative methods for the estimation of methane emissions from open lagoons:

- (a) The Methane Conversion Factor Method (described in Step 1a); and  
(b) The Organic Removal Ratio Method (described in Step 1b).

### *Step 1a: Methane Conversion Factor Method*

The baseline methane emissions from anaerobic treatment of the wastewater in open lagoons (Scenario 1) are estimated based on the chemical oxygen demand (COD) of the wastewater that would enter the lagoon in the absence of the project activity ( $COD_{PJ,y}$ ), the maximum methane producing capacity ( $B_o$ ) and a methane conversion factor ( $MCF_{BL,y}$ ) which expresses the proportion of the wastewater that would decay to methane, as follows:

$$BE_{CH_4,y} = GWP_{CH_4} \times MCF_{BL,y} \times B_o \times COD_{BL,y}$$

Where:

- $BE_{CH_4,y}$  = Methane emissions from anaerobic treatment of the wastewater in open lagoons (Scenario 1) in the absence of the project activity in year  $y$  ( $tCO_2e/yr$ )  
 $GWP_{CH_4}$  = Global Warming Potential of methane valid for the commitment period ( $tCO_2e/tCH_4$ )  
 $B_o$  = Maximum methane producing capacity, expressing the maximum amount of  $CH_4$  that can be produced from a given quantity of chemical oxygen demand ( $tCH_4/tCOD$ )  
 $MCF_{BL,y}$  = Average baseline methane conversion factor (fraction) in year  $y$ , representing the fraction of ( $COD_{PJ,y} \times B_o$ ) that would be degraded to  $CH_4$  in the absence of the project activity  
 $COD_{BL,y}$  = Quantity of chemical oxygen demand that would be treated in open lagoons (Scenario 1) in the absence of the project activity in year  $y$  ( $tCOD/yr$ )

### Determination of $COD_{BL,y}$

In principle, the baseline chemical oxygen demand ( $COD_{BL,y}$ ) corresponds to the chemical oxygen demand that is treated under the project activity ( $COD_{PJ,y}$ ) because the wastewater (Scenario 1) treated under the project activity would in the absence of the project activity be directed to the open lagoon (Scenario 1), and thus  $COD_{BL,y} = COD_{PJ,y}$ .

If there would be an effluent from the lagoons (Scenario 1) in the baseline,  $COD_{BL}$  should be adjusted by an effluent adjustment factor which relates the COD supplied to the lagoon with the COD in the effluent, as follows:

$$COD_{BL,y} = AD_{BL} \times COD_{PJ,y}$$

Where:

- $COD_{BL,y}$  = Quantity of chemical oxygen demand that would be treated in open lagoons (Scenario 1) in the absence of the project activity in year  $y$  ( $tCOD/yr$ )  
 $COD_{PJ,y}$  = Quantity of chemical oxygen demand that is treated in the anaerobic digester in the project

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$AD_{BL}$  = activity in year  $y$  (t COD/yr)  
= Effluent adjustment factor expression the percentage of COD that is degraded in open lagoons (Scenario 1) in the absence of the project activity

$AD_{BL}$  is determined as follows:

## For project activities implemented in existing facilities

(a) In the case when at least one year historical data of the COD inflow and COD effluent are available,  $AD_{BL}$  should be determined as follows:

$$AD_{BL} = 1 - \frac{COD_{out,x}}{COD_{in,x}}$$

Where:

$AD_{BL}$  = Effluent adjustment factor expression the percentage of COD that is degraded in open lagoons (Scenario 1) in the absence of the project activity  
 $COD_{out,x}$  = COD of the effluent in the period  $x$  (t COD)  
 $COD_{in,x}$  = COD directed to the open lagoons (Scenario 1) in the period  $x$  (t COD)  
 $x$  = Representative historical reference period (at least one year)

(b) In the case when at least one year historical data of the COD inflow and COD effluent are not available,  $AD_{BL}$  should be determined as follows:

$AD_{BL}$  is determined by conducting measurements of the COD inflow to and effluent from the lagoon during a measurement campaign of at least 10 days. The measurements should be undertaken during a period that is representative for the typical operation conditions of the plant and ambient conditions of the site (temperature, etc). The average  $COD_{in}$  and  $COD_{out}$  values from the measurement campaign shall be used in the calculation of  $AD_{BL}$  and the result shall be multiplied by 0.89 to account for the uncertainty range (of 30% to 50%) associated with this approach as compared to one-year historical data.

## For project activities implemented in Greenfield facilities

In the case of project activities implemented in Greenfield facilities, where the baseline is a new to be built anaerobic lagoon,  $AD_{BL}$  is determined based on the design features that were identified as the baseline in the procedure outlined in Step 1 of the "procedure for the identification of the most plausible baseline scenario", by using, in the calculation of  $AD_{BL}$ , the design COD inflow for  $COD_{in}$  and the design effluent COD flow for  $COD_{out}$ .

$COD_{PJ,y}$  is determined as follows:

$$COD_{PJ,y} = \sum_{m=1}^{12} F_{PJ,dig,m} \times w_{COD,dig,m}$$

Where:

$COD_{PJ,y}$  = Quantity of chemical oxygen demand that is treated in the anaerobic digester or under clearly

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- $F_{PJ,dig,m}$  = aerobic conditions in the project activity in year  $y$  (t COD/yr)  
 = Quantity of wastewater or sludge that is treated in the anaerobic digester in the project activity in month  $m$  (m<sup>3</sup>/month)  
 $W_{COD,dig,m}$  = Average chemical oxygen demand in the wastewater that is treated in the anaerobic digester in the project activity in month  $m$  (t COD / m<sup>3</sup>)  
 $M$  = Months of year  $y$  of the crediting period

## Determination of $MCF_{BL,y}$

The quantity of methane generated from COD disposed to the open lagoon (Scenario 1) depends mainly on the temperature and the depth of the lagoon. Accordingly, the methane conversion factor is calculated based on a factor  $f_d$ , expressing the influence of the depth of the lagoon on methane generation, and a factor  $f_{T,y}$  expressing the influence of the temperature on the methane generation. In addition, a conservativeness factor of 0.89 is applied to account for the considerable uncertainty associated with this approach.  $MCF_{BL,y}$  is calculated as follows:

$$MCF_{BL,y} = f_d \times f_{T,y} \times 0.89$$

Where:

- $MCF_{BL,y}$  = Average baseline methane conversion factor (fraction) in year  $y$ , representing the fraction of ( $COD_{PJ,y} \times B_o$ ) that would be degraded to CH<sub>4</sub> in the absence of the project activity  
 $f_d$  = Factor expressing the influence of the depth of the lagoon on methane generation  
 $f_{T,y}$  = Factor expressing the influence of the temperature on the methane generation in year  $y$   
 0.89 = Conservativeness factor

## Determination of $f_{T,y}$

In some regions, the ambient temperature varies significantly over the year. Therefore, the factor  $f_{T,y}$  is calculated with the help of a monthly stock change model which aims at assessing how much COD degrades in each month. For each month  $m$ , the quantity of wastewater directed to the lagoon, the quantity of organic compounds that decay and the quantity of any effluent water from the lagoon is balanced, giving the quantity of COD that is available for degradation in the next month: The amount of organic matter available for degradation to methane ( $COD_{available,m}$ ) is assumed to be equal to the amount of organic matter directed to the open lagoon, less any effluent, plus the COD that may have remained in the lagoon from previous months, as follows:

$$COD_{available,m} = COD_{BL,m} + (1 - f_{T,m}) \times COD_{available,m-1} \text{ with}$$

$$COD_{BL,m} = AD_{BL} \times COD_{PJ,m} \text{ and}$$

$$COD_{PJ,m} = F_{PJ,dig,m} \times W_{COD,dig,m}$$

Where:

- $COD_{available,m}$  = Quantity of chemical oxygen demand available for degradation in the open lagoon in month  $m$  (t COD/month)  
 $COD_{BL,m}$  = Quantity of chemical oxygen demand that would be treated in open lagoons (Scenario 1) in the absence of the project activity in month  $m$  (t COD/month)  
 $COD_{PJ,m}$  = Quantity of chemical oxygen demand that is treated in the anaerobic digester in the project activity in month  $m$  (t COD/month)  
 $AD_{BL}$  = Effluent adjustment factor expressing the percentage of COD that is degraded in open lagoons

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	(Scenario 1)
$F_{PJ,dig,m}$	= Quantity of wastewater that is treated in the anaerobic digester in the project activity in month $m$ (m <sup>3</sup> /month)
$W_{COD,dig,m}$	= Average chemical oxygen demand in the wastewater that is treated in the anaerobic digester in the project activity in month $m$ (t COD/m <sup>3</sup> )
$f_{T,m}$	= Factor expressing the influence of the temperature on the methane generation in month $m$
$m$	= Months of year $y$ of the crediting period

The carry-over calculations are limited to a maximum of one year. In case the residence time in the open lagoon is less than one year, carry-on calculations are limited to the period where the wastewater remains in the lagoon. That is in the case of the emptying of a sludge pit, the accumulation of organic matter restarts with the next inflow and the COD available from the previous month should be set to zero. Project participants should provide evidence of the typical residence time of the organic matter in the lagoon.

In the case of project activities implemented in Greenfield facilities, where the baseline is a new to be built anaerobic lagoon, use the residence time of organic matter according to the design features of the lagoon that was identified as the baseline in Step 1 of the section "Procedure for the identification of the most plausible baseline scenario".

The monthly factor to account for the influence of the temperature on methane generation is calculated based on the following "van't Hoff – Arrhenius" approach:

$$f_{T,m} = \begin{cases} 0 & \text{if } T_{2,m} < 283 \text{ K} \\ \exp\left(\frac{E * (T_{2,m} - T_1)}{R * T_1 * T_{2,m}}\right) & \text{if } 283 \text{ K} < T_{2,m} < 303 \text{ K} \\ 1 & \text{if } T_{2,m} > 303 \text{ K} \end{cases}$$

Where:

$f_{T,m}$	= Factor expressing the influence of the temperature on the methane generation in month $m$
$E$	= Activation energy constant (15,175 cal/mol)
$T_{2,m}$	= Average temperature at the project site in month $m$ (K)
$T_1$	= 303.16 K (273.16 K + 30 K)
$R$	= Ideal gas constant (1.987 cal/K mol)
$M$	= Months of year $y$ of the crediting period

As indicated above, the value of  $f_{T,m}$  cannot exceed 1 and should be assumed to be zero if the ambient temperature is below 10°C.

Based on the monthly values  $f_{T,m}$  the annual value  $f_{T,y}$  is calculated as follows:

$$f_{T,y} = \frac{\sum_{m=1}^{12} f_{T,m} \times COD_{available,m}}{\sum_{m=1}^{12} COD_{BL,m}}$$

Where:

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$f_{T,y}$	=	Factor expressing the influence of the temperature on the methane generation in year $y$
$f_{T,m}$	=	Factor expressing the influence of the temperature on the methane generation in month $m$
$COD_{available,m}$	=	Quantity of chemical oxygen demand available for degradation in the open lagoon in month $m$ (t COD/month)
$COD_{BL,m}$	=	Quantity of chemical oxygen demand that would be treated in open lagoons (Scenario 1) in the absence of the project activity in month $m$ (t COD/month)
$M$	=	Months of year $y$ of the crediting period

## Step 1b: Organic removal ratio (ORR) method

The organic removal ratio method measures the reduction of chemical oxygen demand (COD) in a wastewater between its entry into and exit from the treatment system (the open lagoon). The organic removal ratio is a project specific factor expressing the fraction of COD that is degraded in the open lagoon (i.e. between the entry and exit points).

Losses of COD in a lagoon system occur through three main routes:

- Anaerobic decomposition (and consequently methane emissions);
- Oxidative decomposition, either aerobic at the pond surface, or through chemical oxidation where there is a presence of an oxidizing product, such as sulphate from sulphuric acid ( $SO_4^{2-}$  from  $H_2SO_4$ );
- Sedimentation of certain suspended materials that can be lost through other routes, and settle to the lagoon bottom, remaining on a more or less permanent basis.

The organic removal ratio method acknowledges these different losses of COD. Baseline methane emissions from anaerobic treatment of the wastewater in open lagoons (Scenario 1) are estimated based on a mass balance of the organic matter, as follows:

$$BE_{CH_4,y} = GWP_{CH_4} \times B_o \times (COD_{BL,y} - COD_{aerobic,BL} - COD_{OX,BL,y} - COD_{sedim,BL,y})$$

Where:

$BE_{CH_4,y}$	=	Methane emissions from anaerobic treatment of the wastewater in open lagoons (Scenario 1) in the absence of the project activity in year $y$ (tCO <sub>2</sub> e/yr)
$GWP_{CH_4}$	=	Global Warming Potential of methane valid for the commitment period (tCO <sub>2</sub> e/tCH <sub>4</sub> )
$B_o$	=	Maximum methane producing capacity, expressing the maximum amount of CH <sub>4</sub> that can be produced from a given quantity of chemical oxygen demand (tCH <sub>4</sub> /tCOD)
$COD_{BL,y}$	=	Quantity of chemical oxygen demand that would be treated in open lagoons (Scenario 1) in the absence of the project activity in year $y$ (t COD/yr)
$COD_{aerobic,BL}$	=	Annual quantity of chemical oxygen demand that would degrade aerobically in the lagoon (t COD/yr)
$COD_{OX,BL,y}$	=	Annual quantity of chemical oxygen demand that would be chemically oxidised through sulphate in the wastewater in year $y$ (t COD/yr)
$COD_{sedim,BL,y}$	=	Amount of chemical oxygen demand lost through sedimentation in the lagoon before the start of the project activity (t COD/yr)

$COD_{BL,y}$  is determined as per the methane conversion factor method.

## Determination of $COD_{aerobic,BL}$

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$COD_{aerobic,BL}$  is calculated based on the surface of the lagoon or sludge pit and a default value for the amount of COD per hectare that degrades under aerobic conditions, as follows:

$$COD_{aerobic,BL} = A \times f_{COD,aerobic}$$

Where:

$COD_{aerobic,BL}$  = Annual quantity of chemical oxygen demand that would degrade aerobically in the lagoon (t COD/yr)

A = Surface of the lagoon (ha)

$f_{COD,aerobic}$  = Quantity of chemical oxygen demand degraded to  $CO_2$  under aerobic conditions per surface area of the lagoon (t COD/ha yr)

## Determination of $COD_{OX,BL,y}$

The determination of this parameter is relevant if the wastewater contains chemical substances that chemically oxidize organic matter in the wastewater. The most likely chemical substance that may be present is the sulphate ion ( $SO_4^{2-}$ ) from use in the process of sulphuric acid. Project participants should identify which chemical substances are relevant for the wastewater. The concentration of these chemical substances is monitored and the reduction in chemical oxygen demand due to the chemical oxidation of organic matter is then determined as follows:

$$COD_{OX,BL,y} = F_{PJ,y} \times \sum_s w_{s,y} \times R_s \times 0.001 \quad \text{with}$$

$$F_{PJ,y} = \sum_m F_{PJ,dig,m}$$

Where:

$COD_{OX,BL,y}$  = Annual quantity of chemical oxygen demand that would be chemically oxidised through sulphate in the wastewater in year y (t COD/yr)

$F_{PJ,y}$  = Quantity of wastewater treated in the digester in year y ( $m^3$ /yr)

$w_{s,y}$  = Average concentration of chemical oxidative substance s in the wastewater treated in the digester in year y ( $kg/m^3$ )

$R_s$  = Specific reduction in chemical oxygen demand by substance s (t COD/t substance)

S = Substances in the wastewater that can chemically oxidize organic matter

$F_{PJ,dig,m}$  = Quantity of wastewater that is treated in the anaerobic digester in the project activity in month m

## Determination of $COD_{sedim,BL,y}$

To estimate  $COD_{sedim,BL,y}$  the Chemical Oxygen Demand that is lost through sedimentation, the first step is to characterise the type of organic waste material in order to determine the likelihood of any sedimentation actually taking place. In addition, the conditions in the existing lagoon system must also be assessed to determine the lagoon dynamics in relation to mixing. Those lagoons so identified as highly anaerobically active have the characteristic to keep all the material that would sediment in a state of permanent suspension, this material is then anaerobically degraded. Where such characteristics of sedimentation are identified, the fraction of Chemical Oxygen Demand lost to sedimentation is determined by monitoring the rate of COD entering the pond system and the rate at which pond depth alters over time. Then, a relationship between pond depth and sedimentation can be established.

## Pond Based Sedimentation Determination

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Daily pond sedimentation rates vary in a seasonally operated industry. There are no hard average numbers for the dynamic deposition rate to be expected. Project proponents should determine whether the wastewater contains material that is likely to sediment, and assess whether the pond dynamics are such that such sedimentation will occur. Where these conditions occur, an analysis must be carried out as to the rate of this sedimentation. Having verified these conditions, project proponents should measure the net annual effect of the COD deposition into the sediment of individual ponds at long time intervals because the pond sediment sludge amount accumulates gradually over the years. This is often shown by the historic evidence of gradually shrinking working volumes of the treatment pond(s) in question.

## Approach to determine the net annual COD sedimentation in wastewater treatment ponds

A GPS grid of at least 20 sampling points/pond will be put over each pond that is monitored. The distance of the GPS points from the pond bank needs to be at least 2 m. Twice a year (start of season and end of season) the following protocol will be performed:

- (a) At each sampling time, determine pond water level height at all four corners of the pond by theodolite against an absolute height reference, ideally a concrete wall (accuracy  $> + / - 5$  mm);
- (b) Using an immersible turbidimeter mounted on a calibrated depth probe chain measure the sediment surface height relative to the water surface at the points indicated by the GPS grid;

Note: Gas masks/face shields need to be worn for this task due to the risk of H<sub>2</sub>S poisoning and high temperatures. There is also a high fire risk on the pond surface. Thus under no circumstances can flammable items, cellphones or other equipment that could trigger a spark be brought onto the pond surface. This instruction must be obeyed at all times.

With a rowing boat determine at each GPS point the relative pond water column depth relative to the absolute height reference determined under (a). Calculate the relative increase/decrease in the average sediment height of the pond system twice/year, i.e. at the beginning and the end of a season determining the change in between seasons by calculation.

(c) Obtain a 10 cm diam x 40 cm core of the sediment layer at each GPS point with a core sampler (4 " plastic pipe). Combine the 0-20 cm layer cores and the 20-40 cm layer cores for all 20 points into a large drum. Mix the combined 0-20 cm (fraction A) and 20-40 cm samples (fraction B) with a metal or plastic rod. Take four random sub-samples of each of the two combined samples to determine VSS, TSS and COD. Carry out the sediment composition analysis in an experienced laboratory such as Waste Solutions Ltd, Analytical Laboratory;

(d) Calculate the mean  $+ / -$  SD for COD, VSS, TSS of each group. Perform a test of statistical significance of any observed changes (t-test, paired) by comparing the paired pre-season / pre-season and paired post-season / post-season samples for two consecutive years. Any real COD accumulation / deposition trend (if real) must be visible in the paired pre-season / pre-season and paired post-season / post-season time points. The net COD deposition relative for the methane abatement balance in a season is determined by comparing the net sediment mass (COD, VSS, TSS) in the pond at the beginning of a new season with the previously measured pre-existing net deposition at the beginning of the previous season. It is assumed that the net sediment COD deposition by sedimentation in a steady state situation has the composition of the sediment material of the B-fraction because the B-fraction is the actual accumulating stable end product in the pond sediment;

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(e) The amount of accumulated sediment COD / pond deposited every year is then determined as follows.

- Determine B-fraction COD content (g COD/g sediment; wet basis);
- Calculate the net accumulated COD in pond (Mg/pond/year) as:

Accumulated COD = [area (m<sup>2</sup>) x increase (m/year)] x sediment density x COD content B-fraction (gCOD/gwet).

The equations above will be applied on a case by case basis and documented in the CPA-DD.

The CPA implementer will either choose either MCF or ORR approach based on the suitability of the method for the CPAs.

The formulae required to estimate the methane emission from open lagoons have been transparently presented in section E.6.1 of the PoA-DD <sup>/36/</sup>. Validation team has reviewed the description and the formulae and confirm that the description and the formulae provided are inline with the applied methodology <sup>/2/</sup>.

## Step 2: Baseline emissions from generation and/or consumption of electricity

In this step, baseline emissions from the following sources are estimated:

- Baseline emissions from consumption of electricity associated with the treatment of wastewater (Scenario 1);
- If electricity is generated with biogas from a new anaerobic digester under the project activity: baseline emissions from the generation of electricity in the grid (E2) and/or with a captive fossil fuel fired power plant (E1) in the absence of the electricity generation with biogas.

Baseline emissions from the generation and / or consumption of electricity are calculated as follows:

$$BE_{EL,y} = (EC_{BL} + EG_{PJ,y}) \times EF_{BL,EL,y}$$

Where:

- $BE_{EL,y}$  = CO<sub>2</sub> emissions associated with electricity generation that is displaced by the project activity and/or electricity consumption in the absence of the project activity in year y (tCO<sub>2</sub>/yr)
- $EC_{BL}$  = Annual quantity of electricity that would be consumed in the absence of the project activity for the treatment of the wastewater (Scenario 1) (MWh/yr)
- $EG_{PJ,y}$  = Net quantity of electricity generated in year y with biogas from the new anaerobic biodigester (MWh/yr)
- $EF_{BL,EL,y}$  = Baseline emission factor for electricity generated and / or consumed in the absence of the project activity in year y (tCO<sub>2</sub>/MWh)

The determination of  $EF_{BL,EL,y}$  depends on the baseline scenario and the configuration at the project site.

The grid emission factor should be used ( $EF_{BL,EL,y} = EF_{grid,y}$ ) if the baseline scenario for displacement of electricity generated with biogas from the anaerobic digester is E2 or, in the case that no electricity is generated at the project site, if no captive fossil fuel fired power plant is operating at the project site in

year  $y$ . In all other cases, the lower emission factor between the grid emission factor and the emission factor of the captive power plant should be used as a conservative simplification,<sup>3</sup> as follows:

$$EF_{BL,EL,y} = \text{MIN}(EF_{grid,y}; EF_{BL,EL,captive})$$

Where:

- $EF_{BL,EL,y}$  = Baseline emission factor for electricity generated and/or consumed in the absence of the project activity in year  $y$  (tCO<sub>2</sub>/MWh)
- $EF_{grid,y}$  = Grid emission factor in year  $y$  (tCO<sub>2</sub>/MWh)
- $EF_{BL,EL,captive}$  = Emission factor of electricity generated by the captive power plant that would have been used in the absence of the project activity (tCO<sub>2</sub>/MWh)

The emission factor of the captive power plant ( $EF_{BL,EL,captive}$ ) may be determined using one of the following options:

- In case of diesel generators: use the value the default emission factor for a diesel generator of 0.8 tCO<sub>2</sub>/MWh;
- Calculate  $EF_{BL,EL,captive}$  as follows:

$$EF_{BL,EL,captive} = \frac{EF_{CO2,FF,captive}}{\eta_{EL,captive}} \times 3.6$$

For the case that grid emission factor is applied, all the formulae required to calculate the baseline electricity emission factor ( $EF_{BL,EL,y}$ ) is transparently presented in section E.6 of the PoA-DD <sup>136/</sup>. Validation team has reviewed the description and the formulae and confirm that the provided description and formulae are in line with the applied methodology and “Tool to calculate the emission factor for an electricity system”, version 02.2.1 as follows:

The Grid Emissions Factor  $EF_{grid,y} = EF_{grid,CM,y}$  will be calculated according to the *Tool to calculate the emission factor for an electricity system*, Version 2.2.1, EB63, Annex 19. The emissions factor  $EF_{grid,CM,y}$  will be calculated using the *ex ante* option at the validation stage. The latest combined margin published by the DNA of Thailand should be used to calculate emission reductions throughout the first crediting period. The stepwise approach to calculating the  $EF_{grid,CM,y}$  shall be applied as follows:

STEP 1: Identify the relevant electricity systems

STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)

STEP 3: Select a method to determine the operating margin (OM)

STEP 4: Calculate the operating margin emission factor according to the selected method

STEP 5: Calculate the build margin (BM) emission factor

STEP 6: Calculate the combined margin (CM) emissions factor

<sup>3</sup> This conservative simplification has been made because it depends on the exact configuration of the project activity to which extent electricity is displaced in the captive fossil fuel fired power plant and/or the grid.

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## STEP 1: Identify the relevant electricity systems

For the purpose of determining the electricity emission factor, the project electricity system is defined as the electricity transmission system of Thailand which is a single system connected by transmission lines throughout the country and owned by the Electricity Generating Authority of Thailand (EGAT).

## STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)

The inclusion of off-grid power plants is an optional step. For the purpose of the Thailand grid, Option I is applied and only grid power plants are included in the calculation.

## STEP 3: Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor ( $EF_{grid,OM,y}$ ) is based on one of the following methods, which are described under Step 4:

- (a) Simple OM; or
- (b) Simple adjusted OM; or
- (c) Dispatch data analysis OM; or
- (d) Average OM.

The simple OM method (option a) can be used if low-cost/must-run resources (LC/MR) constitute less than 50% of total grid generation in the average of the five most recent years. In Thailand, LC/MR plants currently constitute less than 10% and therefore for the current crediting period (option b) Simple OM will be applied.

## STEP 4: Calculate the operating margin emission factor according to the selected method

The simple OM may be calculated by one of the following two options:

- Option A: Based on the net electricity generation and a CO<sub>2</sub> emission factor of each power unit; or
- Option B - Calculation based on total fuel consumption and electricity generation of the system

Currently Option B is applied in Thailand because:

- (a) the net electricity generation and CO<sub>2</sub> emission factor of each power unit is not available; and
  - (b) only renewable power generation was considered as LC/MR and the quantity of electricity supplied to the grid by these sources is available and
  - (c) off-grid power plants are not included in the calculation (ie Option I of Step 2 was chosen).
- If any of these factors, then Option A must be applied following the steps in the Tool.

The simple OM emission factor for Option B is calculated as the generation-weighted average CO<sub>2</sub> emissions per unit net electricity generation (tCO<sub>2</sub>/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \cdot NCV_{i,y} \cdot EF_{CO_2,i,y}}{EG_y}$$

where,

- $EF_{grid,OMsimple,y}$  = Simple operating margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh)
- $FC_{i,y}$  = Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
- $NCV_{i,y}$  = Net calorific value of fossil fuel type i in year y (GJ/mass or volume unit)

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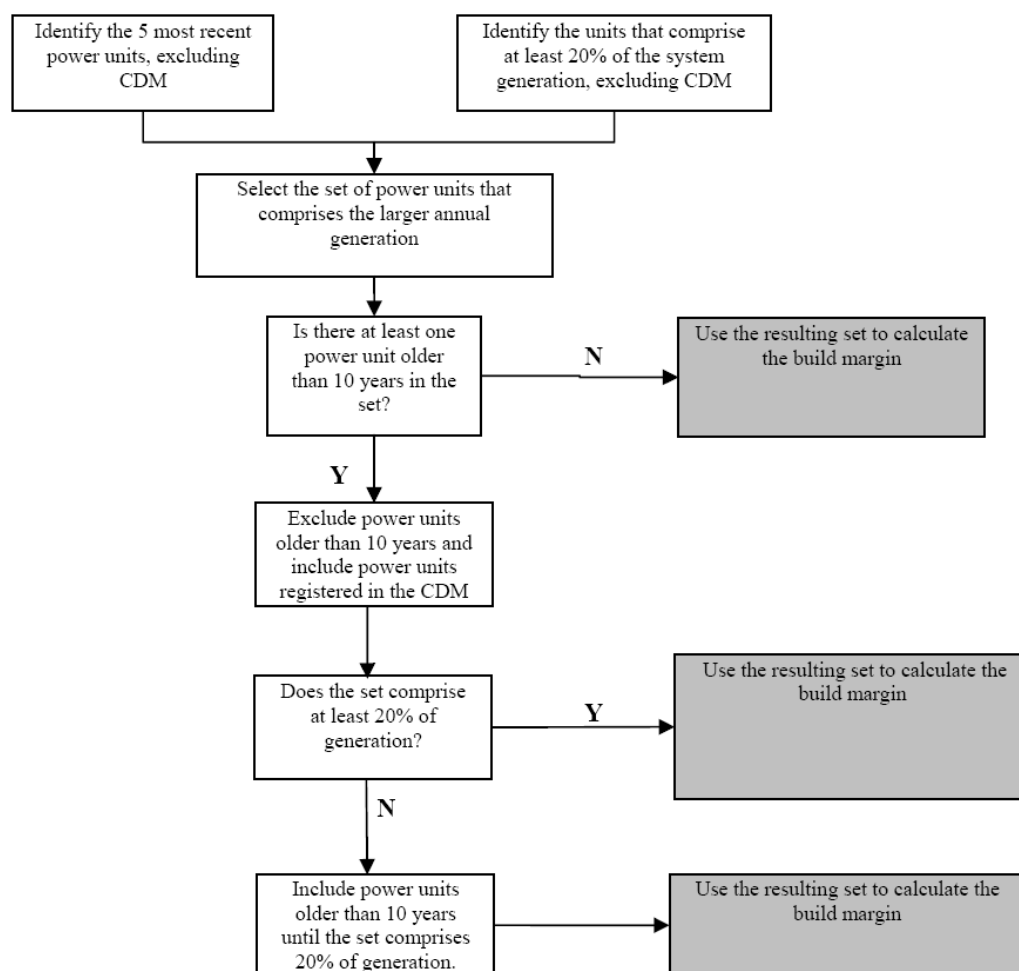
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$EF_{CO_2,i,y}$  = CO<sub>2</sub> emission factor of fossil fuel type  $i$  in year  $y$  (tCO<sub>2</sub>/GJ)  
 $EG_y$  = Net electricity generated & delivered to the grid by all power sources serving the system, not including LC/MR power plants/units in year  $y$  (MWh)  
 $i$  = All fossil fuel types combusted in power sources in the project electricity system in year  $y$   
 $y$  = The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option)

## STEP 5: Calculate the build margin (BM) emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO<sub>2</sub>/MWh) of a sample group of power units, during the most recent year  $y$  for which power generation data is available, The Sample group of power units  $m$  used to calculate the build margin should be determined via the procedure outlined in the Tool and summarised in the following diagram:



The build margin emissions factor is the generation-weighted average emission factor (tCO<sub>2</sub>/MWh) of all power units  $m$  during the most recent year  $y$  for which electricity generation data is available, calculated as follows:

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$$EF_{\text{grid,BM},y} = \frac{\sum_m EG_{m,y} \cdot EF_{\text{EL},m,y}}{\sum_m EG_{m,y}}$$

Where the CO<sub>2</sub> emissions factor of each power unit is calculated as per the simple OM emission factor method, and the other terms are as follows:

$EF_{\text{grid,BM},y}$	= Build margin CO <sub>2</sub> emission factor in year y (tCO <sub>2</sub> /MWh)
$EG_{m,y}$	= Net electricity generated and delivered to the grid by power plant/unit m in year y (MWh)
$EF_{\text{EL},m,y}$	= CO <sub>2</sub> emission factor of power unit m in year y (tCO <sub>2</sub> /MWh)
m	= Power units included in the build margin
y	= The most recent historical year for which power generation data is available

## STEP 6: Calculate the combined margin (CM) emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{\text{grid,CM},y} = EF_{\text{grid,OM},y} \times w_{\text{OM}} + EF_{\text{grid,BM},y} \times w_{\text{BM}}$$

where:

$EF_{\text{grid,BM},y}$	=	Build margin CO <sub>2</sub> emissions factor in year y (tCO <sub>2</sub> /MWh)
$EF_{\text{grid,OM},y}$	=	Operating margin CO <sub>2</sub> emissions factor in year y (tCO <sub>2</sub> /MWh)
$w_{\text{OM}}$	=	Weighting of operating margin emissions factor (%)
$w_{\text{BM}}$	=	Weighting of build margin emissions factor (%)

The weightings for the first crediting period are applied as  $w_{\text{OM}} = 0.5$  and  $w_{\text{BM}} = 0.5$ .

The equations above will be applied on a case by case basis and documented in the CPA-DD.

## Step 3: Baseline emissions from the generation of heat

This step is applicable if the biogas captured from the new anaerobic digester is utilized in the project scenario for heat generation. If the baseline Scenarios H1 or H3 apply,  $BE_{\text{HG},y} = 0$ .<sup>4</sup> If Scenario H2 applies, fossil fuels from the generation of heat in boilers are displaced and baseline emissions are calculated as follows:

$$BE_{\text{HG},y} = \frac{HG_{\text{PJ},y} \times EF_{\text{CO}_2,\text{FF},\text{boiler}}}{\eta_{\text{BL},\text{boiler}}}$$

Where:

$BE_{\text{HG},y}$	=	CO <sub>2</sub> emissions associated with fossil fuel combustion for heating equipment that is displaced by the project in year y (tCO <sub>2</sub> /yr)
$HG_{\text{PJ},y}$	=	Net quantity of heat generated in year y with biogas from the new anaerobic digester (GJ)
$EF_{\text{CO}_2,\text{FF},\text{boiler}}$	=	CO <sub>2</sub> emission factor of the fossil fuel type used in the boiler for heat generation in the absence of the project activity (tCO <sub>2</sub> /GJ)

<sup>4</sup> In case of cogeneration in the absence of the project activity (H1), the emission reductions from using the biogas in a cogeneration plant are already reflected in Step 2.

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$\eta_{BL, boiler}$  = Efficiency of the boiler that would be used for heat generation in the absence of the project activity

The equation above will be applied on a case by case basis and documented in the CPA-DD.

Validation team has reviewed the section E.6 where the above description to calculate the baseline heat emissions is presented and confirm that the formulae provided are inline with the applied methodology.

## Project Emission of a typical CPA:

As per the applied methodology, emissions attributed to the project activity depend on which scenario in Table 1 (of ACM0014)<sup>/2/</sup> applies and the configuration of the project activity. If solid materials are treated in a digester system in a Scenario 1 type projects, project emissions shall be included and calculated the same way as project emissions of the treatment of wastewater.

(i) Methane emissions from the open lagoons or dewatering process (applicable if residual from the anaerobic digester, after treatment, under the project activity, is directed to either open lagoons or to a dewatering facility);

In the case of project activities that introduce an anaerobic digester for the treatment of wastewater:

(ii) Physical leakage of methane from the digester system;

(iii) Methane emissions from flaring (applicable if biogas from the digester is flared);

In the case of project activities that introduce a treatment of sludge or land application of wastewater:

(iv) Methane and nitrous oxide emissions from land application of sludge (if applicable);

In the case of project activities where wastewater is dewatered and directed to land application:

(v) Methane and nitrous oxide emissions from land application of wastewater;

In the case of project activities that consume electricity or heat under the project activity:

(vi) CO<sub>2</sub> emissions from consumption of electricity and or fossil fuels in the project activity.

Project participants should document and justify in the CPA-DD which emission sources are applicable in the context of their project activity.

Project emissions are calculated as follows:

$$PE_y = PE_{CH4, effluent, y} + PE_{CH4, digest, y} + PE_{flare, y} + PE_{sludge, LA, y} + PE_{ww, LA, y} + PE_{EC, y} + PE_{FC, y}$$

Where:

$PE_y$  = Project emissions in year  $y$  (tCO<sub>2</sub>e/yr)

$PE_{CH4, effluent, y}$  = Project emissions from treatment of wastewater effluent from the anaerobic digester in year  $y$  (tCO<sub>2</sub>e/yr)

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$PE_{CH_4,digest,y}$	= Project emissions from physical leakage of methane from the anaerobic digester in year $y$ (tCO <sub>2</sub> e/yr)
$PE_{flare,y}$	= Project emissions from flaring of biogas generated in the anaerobic digester in year $y$ (tCO <sub>2</sub> e/yr)
$PE_{sludge,LA,y}$	= Project emissions from land application of sludge in year $y$ (tCO <sub>2</sub> e/yr)
$PE_{ww,LA,y}$	= Project emissions from land application of wastewater in year $y$ (tCO <sub>2</sub> e/yr)
$PE_{EC,y}$	= Project emissions from electricity consumption in year $y$ (tCO <sub>2</sub> e/yr)
$PE_{FC,y}$	= Project emissions from fossil fuel consumption in year $y$ (tCO <sub>2</sub> e/yr)

## (i) Project methane emissions from effluent from the digester

This emission source is only applicable if a new digester is installed under the project activity and if the effluent from this digester is directed to open lagoons.

A significant amount of the COD load is usually degraded in the new anaerobic digester and open lagoons can be expected to operate under largely aerobic conditions. However, due to the uncertainty regarding the exact extent of aerobic/anaerobic degradation after project implementation, the calculation of any CH<sub>4</sub> emissions is conservatively carried out in the same way as for the baseline, using either the methane conversion factor method or the organic removal ratio method. The same method as for the baseline emissions shall be applied.

### Methane conversion factor method

Project methane emissions from treatment of the effluent from the digester are estimated as follows:

$$PE_{CH_4,effluent,y} = GWP_{CH_4} \times MCF_{PJ,y} \times B_o \times (COD_{PJ,effl,dig,y} - COD_{PJ,effl,lag,y}) \text{ with}$$

$$COD_{PJ,effl,dig,y} = \sum_{m=1}^{12} F_{PJ,effl,dig,m} \times w_{COD,effl,dig,m} \text{ and}$$

$$COD_{PJ,effl,lag,y} = \sum_{m=1}^{12} F_{PJ,effl,lag,m} \times w_{COD,effl,lag,m}$$

Where:

$PE_{CH_4,effluent,y}$	= Project emissions from treatment of wastewater effluent from the anaerobic digester in year $y$ (tCO <sub>2</sub> e/yr)
$GWP_{CH_4}$	= Global Warming Potential of methane valid for the commitment period (tCO <sub>2</sub> e/tCH <sub>4</sub> )
$MCF_{PJ,y}$	= Project methane conversion factor (fraction) in year $y$ , representing the fraction of (COD <sub>PJ,effluent,y</sub> × B <sub>o</sub> ) that degrades to CH <sub>4</sub>
$B_o$	= Maximum methane producing capacity, expressing the maximum amount of CH <sub>4</sub> that can be produced from a given quantity of chemical oxygen demand (tCH <sub>4</sub> /tCOD)
$COD_{PJ,effl,dig,y}$	= Quantity of chemical oxygen demand in the effluent from the digester in year $y$ (tCOD/yr)
$COD_{PJ,effl,lag,y}$	= Quantity of chemical oxygen demand in the effluent of the open lagoon or dewatering facility in which the effluent from the digester is treated in year $y$ (tCOD/yr)
$F_{PJ,effl,dig,m}$	= Quantity of effluent from the digester in month $m$ (m <sup>3</sup> /month)
$w_{COD,effl,dig,m}$	= Average chemical oxygen demand in the effluent from the digester in month $m$ (t COD/m <sup>3</sup> )
$F_{PJ,effl,lag,m}$	= Quantity of effluent from the open lagoon or dewatering facility in which the effluent from the digester is treated in month $m$ (m <sup>3</sup> /month)
$w_{COD,effl,lag,m}$	= Average chemical oxygen demand in the effluent from the open lagoon or dewatering facility in which the effluent from the digester is treated in month $m$ (t COD/m <sup>3</sup> )

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The quantity of methane generated from COD disposed to the open lagoon or in dewatering facility is calculated as follows:

$$MCF_{PJ,y} = f_d \times f_{PJ,T,y}$$

Where:

- $MCF_{PJ,y}$  = Project methane conversion factor (fraction) in year  $y$ , representing the fraction of  $(COD_{PJ,effluent,y} \times B_o)$  that degrades to  $CH_4$
- $f_d$  = Factor expressing the influence of the depth of the lagoon or dewatering facility on methane generation
- $f_{PJ,T,y}$  = Factor expression the influence of the temperature on the methane generation under the project activity in year  $y$

The factor  $f_{T,PJ,y}$  is calculated, as under baseline emissions, with the help of a monthly stock change model which aims at assessing how much COD degrades in each month, as follows:

$$COD_{PJ,available,m} = (COD_{PJ,effl,dig,m} - COD_{PJ,effl,lag,m}) + (1 - f_{T,m}) \times COD_{PJ,available,m-1} \quad \text{with}$$

$$COD_{PJ,effl,dig,m} = F_{PJ,effl,dig,m} \times w_{COD,effl,dig,m} \quad \text{and}$$

$$COD_{PJ,effl,lag,m} = F_{PJ,effl,lag,m} \times w_{COD,effl,lag,m}$$

Where:

- $COD_{PJ,available,m}$  = Quantity of chemical oxygen demand available for degradation in the open lagoon or dewatering facility under the project activity in month  $m$  (t COD/month)
- $COD_{PJ,effl,dig,m}$  = Quantity of chemical oxygen demand in the effluent from the digester in month  $m$  (tCOD/month)
- $COD_{PJ,effl,lag,m}$  = Quantity of chemical oxygen demand in the effluent of the open lagoon or dewatering facility in which the effluent from the digester is treated in month  $m$  (tCOD/month)
- $F_{PJ,effl,dig,m}$  = Quantity of effluent from the digester in month  $m$  (m<sup>3</sup>/month)
- $w_{COD,effl,dig,m}$  = Average chemical oxygen demand in the effluent from the digester in month  $m$  (t COD/m<sup>3</sup>)
- $F_{PJ,effl,lag,m}$  = Quantity of effluent from the open lagoon or dewatering facility in which the effluent from the digester is treated in month  $m$  (m<sup>3</sup>/month)
- $w_{COD,effl,lag,m}$  = Average chemical oxygen demand in the effluent from the open lagoon or dewatering facility in which the effluent from the digester is treated in month  $m$  (t COD/m<sup>3</sup>)
- $f_{T,m}$  = Factor expressing the influence of the temperature on the methane generation in month  $m$
- $m$  = Months of year  $y$  of the crediting period

As for the baseline emissions, the carry-over calculations are limited to a maximum of one year. In case the residence time in the open lagoon or the dewatering facility is less than one year, carry-on calculations are limited to the period where the wastewater remains in the lagoon or dewatering facility. Project participants should provide evidence of the typical residence time of the organic matter in the lagoon or the dewatering facility.

The monthly factor to account for the influence of the temperature on methane generation is calculated as per the equation for  $f_{T,m}$  above.

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Based on the monthly values  $f_{T,m}$  the annual value  $f_{T,PJ,y}$  is calculated as follows:

$$f_{PJ,T,y} = \frac{\sum_{m=1}^{12} f_{T,m} \times \text{COD}_{PJ,available,m}}{\sum_{m=1}^{12} (\text{COD}_{PJ,effl,dig,m} - \text{COD}_{PJ,effl,lag,m})}$$

Where:

- $f_{PJ,T,y}$  = Factor expressing the influence of the temperature on the methane generation under the project activity in year  $y$
- $f_{T,m}$  = Factor expressing the influence of the temperature on the methane generation in month  $m$
- $\text{COD}_{PJ,available,m}$  = Quantity of chemical oxygen demand available for degradation in the open lagoon or dewatering facility under the project activity in month  $m$  (t COD/month)
- $\text{COD}_{PJ,effl,dig,m}$  = Quantity of chemical oxygen demand in the effluent from the digester in month  $m$  (tCOD/month)
- $\text{COD}_{PJ,effl,lag,m}$  = Quantity of chemical oxygen demand in the effluent of the open lagoon or dewatering facility in which the effluent from the digester is treated in month  $m$  (tCOD/month)
- $M$  = Months of year  $y$  of the crediting period

## Organic removal ratio method

As for baseline emissions, methane emissions from anaerobic treatment of the effluent from the digester are estimated based on a mass balance of the organic matter, as follows:

$$\text{PE}_{\text{CH}_4, \text{effluent}, y} = \text{GWP}_{\text{CH}_4} \times B_o \times (\text{COD}_{PJ,effl,dig,y} - \text{COD}_{PJ,aerobic} - \text{COD}_{PJ,OX,y} - \text{COD}_{PJ,se dim,y} - \text{COD}_{PJ,effl,lag,y})$$

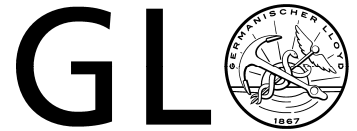
Where:

- $\text{PE}_{\text{CH}_4, \text{effluent}, y}$  = Project emissions from treatment of wastewater effluent from the anaerobic digester in year  $y$  (tCO<sub>2</sub>e/yr)
- $\text{GWP}_{\text{CH}_4}$  = Global Warming Potential of methane valid for the commitment period (tCO<sub>2</sub>e/tCH<sub>4</sub>)
- $B_o$  = Maximum methane producing capacity, expressing the maximum amount of CH<sub>4</sub> that can be produced from a given quantity of chemical oxygen demand (tCH<sub>4</sub>/tCOD)
- $\text{COD}_{PJ,effl,dig,y}$  = Quantity of chemical oxygen demand in the effluent from the digester in year  $y$  (t COD/yr)
- $\text{COD}_{PJ,aerobic}$  = Annual quantity of chemical oxygen demand that degrades aerobically in the lagoon under the project activity (t COD/yr)
- $\text{COD}_{PJ,OX,y}$  = Annual quantity of chemical oxygen demand that is chemically oxidised through oxidizing substances in the effluent from the digester in year  $y$  (t COD/yr)
- $\text{COD}_{PJ,se dim,y}$  = Amount of chemical oxygen demand lost through sedimentation in the lagoon under the project activity (t COD/yr)
- $\text{COD}_{PJ,effl,lag,y}$  = Quantity of chemical oxygen demand in the effluent of the open lagoon or dewatering facility in which the effluent from the digester is treated in year  $y$  (t COD/yr)

$\text{COD}_{PJ,effl,dig,y}$  and  $\text{COD}_{PJ,effl,lag,y}$  are determined as for the equivalent equations for baseline emissions.  $\text{COD}_{PJ,aerobic}$  is determined as for the equivalent equation under baseline emissions.  $\text{COD}_{sedim,PJ,y}$  is determined following the same procedure for  $\text{COD}_{sedim,BL,y}$ ,  $\text{COD}_{PJ,OX,y}$  is determined, as under baseline emissions, as follows:

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$$COD_{PJ,OX,y} = \sum_m^{12} F_{PJ,effl,dig,m} \times \sum_s w_{s,effl,y} \times R_s \times 0.001$$

Where:

- $COD_{PJ,OX,y}$  = Annual quantity of chemical oxygen demand that is chemically oxidised through oxidizing substances in the effluent from the digester in year  $y$  (t COD/yr)
- $F_{PJ,effl,dig,m}$  = Quantity of effluent from the digester in month  $m$  (m<sup>3</sup>/month)
- $w_{s,effl,y}$  = Average concentration of chemical oxidative substance  $s$  in the effluent from the digester in year  $y$  (kg/m<sup>3</sup>)
- $R_s$  = Specific reduction in chemical oxygen demand by substance  $s$  (t COD/t substance)
- $S$  = Substances in the effluent of the digester that can chemically oxidize organic matter

## *(ii) Project emissions related to physical leakage from the digester*

This emission source is only applicable if the project activity includes the construction of a new anaerobic digester. The emissions directly associated with the operation of digesters involve the physical leakage of methane from the digester system. Methane emissions from the new digester are calculated as follows:

$$PE_{CH4,digest,y} = F_{biogas,y} \times FL_{biogas,digest} \times w_{CH4,biogas,y} \times GWP_{CH4} \times 0.001$$

Where:

- $PE_{CH4,digest,y}$  = Project emissions from physical leakage of methane from the anaerobic digester (tCO<sub>2</sub>e / yr)
- $F_{biogas,y}$  = Amount of biogas collected in the outlet of the new digester in year  $y$  (m<sup>3</sup>/yr)
- $FL_{biogas,digest}$  = Fraction of biogas that leaks from the digester (m<sup>3</sup> biogas leaked/m<sup>3</sup> biogas produced)
- $w_{CH4,biogas,y}$  = Concentration of methane in the biogas in the outlet of the new digester (kg CH<sub>4</sub>/m<sup>3</sup>)
- $GWP_{CH4}$  = Global Warming Potential of methane valid for the commitment period (tCO<sub>2</sub>e/tCH<sub>4</sub>)

## *(iii) Methane emissions from flaring*

Methane emissions that occur due to incomplete flaring will be calculated as per the "Tool to determine project emissions from flaring gases containing methane" (Version 1). If an open flare is installed, the flare efficiency cannot be measured in a reliable manner (i.e. external air will be mixed and will dilute the remaining methane) and a default value of 50% is to be used provided that it can be demonstrated that the flare is operational. The flare efficiency in the hour  $h$  ( $\eta_{flare,h}$ ) 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  $h$ .

If an enclosed flare is used, the temperature in the exhaust gas of the flare is measured to determine whether the flare is operating or not, and in accordance with section II of the Tool, option (a) will be used to determine the flare efficiency of the enclosed flare as follows:

- (a) To use a 90% default value. Continuous monitoring of compliance with manufacturer's specification of flare (temperature, flow rate of residual gas at the inlet of the flare) must be performed. If in a specific hour any of the parameters are out of the limit manufacturer's

specifications, a 50% default value for the flare efficiency should be used for the calculations for this specific hour.

If there is no record of the temperature of the exhaust gas of the flare or if the recorded temperature is less than 500 °C for any particular hour, it shall be assumed that during that hour the flare efficiency is zero.

The default value for flare efficiency will be used therefore steps 3 and 4 of the flaring tool are not applicable. As a simplified approach, project participants may only measure the volumetric fraction of methane and consider the difference to 100% as being nitrogen and the corresponding calculations on steps 1 and 2 are also not required. As such, the flare emissions are calculated with Steps 5-7 of the flaring tool as follows:

The methane mass flow rate in the flare gas stream is calculated using Step 5 of the Tool as follows:

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

Where,

$TM_{RG,h}$	= Mass flow rate of methane in the residual gas in hour $h$ (kg/h)
$FV_{RG,h}$	= Volumetric flow rate of the residual gas in dry basis at normal conditions in hour $h$ (m <sup>3</sup> /h)
$fv_{CH4, RG,h}$	= Volumetric fraction of methane in the residual gas on dry basis in hour $h$ (NB: this corresponds to $fv_{iRG,h}$ where $i$ refers to methane)
$\rho_{CH4,n}$	= Density of methane at normal conditions (0.716 kg/m <sup>3</sup> )

As stated above, the default efficiency factor has been selected for the flare. In accordance with Step 6 of the Tool, the determination of hourly flare efficiency depends on the operation of flare and the type of flare used. In the case where the default value for flare efficiency is applied to enclosed flares, the flare efficiency in hour  $h$  ( $\eta_{flare,h}$ ) is:

- 0% if the temperature in the exhaust 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 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  $h$ .

In case of open flares, the flare efficiency in hour  $h$  ( $\eta_{flare,h}$ ) 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  $h$ .

Project emissions from flaring are calculated using step 7 of the Tool, 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  $h$  ( $\eta_{flare,h}$ ) as follows:

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$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times GWP_{CH4}/1000$$

where,

- $PE_{flare,y}$  = Project emissions from flaring of the residual gas stream in year  $y$  (tCO<sub>2</sub>e)  
 $TM_{RG,h}$  = Mass flow rate of methane in the residual gas in hour  $h$  (kg/h)  
 $\eta_{flare,h}$  = Flare efficiency in hour  $h$   
 $GWP_{CH4}$  = Global Warming Potential of methane valid for the commitment period (tCO<sub>2</sub>e/tCH<sub>4</sub>)

## (iv) Project emissions from land application of sludge

This emission source is only applicable if under the project activity sludge is applied on lands. For conservativeness, an MCF of 0.05 is to be used to estimate possible methane emissions from the land application treatment process to account for any possible anaerobic pockets. These emissions are to be estimated from the following equations:

$$PE_{sludge,LA,y} = COD_{sludge,LA,y} \times B_o \times MCF_{sludge,LA} \times GWP_{CH4} + N_{sludge,LA,y} \times EF_{N2O,LA,sludge} \times GWP_{N2O}$$

with

$$COD_{sludge,LA,y} = \sum_{m=1}^{12} S_{LA,m} \times w_{sludge,COD,LA,m} \quad \text{and}$$

$$N_{sludge,LA,y} = \sum_{m=1}^{12} S_{LA,m} \times w_{N,sludge,m}$$

Where:

- $PE_{sludge,LA,y}$  = Project emissions from land application of sludge in year  $y$  (tCO<sub>2</sub>e/yr)  
 $COD_{sludge,LA,y}$  = Chemical oxygen demand (COD) of the sludge applied to land after the dewatering process in year  $y$  (tCOD/yr)  
 $B_o$  = Maximum methane producing capacity, expressing the maximum amount of CH<sub>4</sub> that can be produced from a given quantity of chemical oxygen demand (tCH<sub>4</sub>/tCOD)  
 $MCF_{sludge,LA}$  = Methane conversion factor for the application of sludge to lands  
 $GWP_{CH4}$  = Global Warming Potential of methane valid for the applicable commitment period (tCO<sub>2</sub>e/tCH<sub>4</sub>)  
 $w_{sludge,COD,LA,m}$  = Average chemical oxygen demand in the sludge applied to land after the dewatering process in month  $m$  (t COD/t sludge)  
 $S_{LA,m}$  = Amount of sludge applied to land in month  $m$  (t sludge/month)  
 $N_{sludge,LA,y}$  = Amount of nitrogen in the sludge applied to land in year  $y$  (t N/yr)  
 $w_{N,sludge,m}$  = Mass fraction of nitrogen in the sludge applied to land in month  $m$  (t N/t sludge)  
 $EF_{N2O,LA,sludge}$  = N<sub>2</sub>O emission factor for nitrogen from sludge applied to land (t N<sub>2</sub>O/t N)  
 $GWP_{N2O}$  = Global Warming Potential of nitrous dioxide (tCO<sub>2</sub>e/tN<sub>2</sub>O)

## (v) Project emissions from land application of wastewater

This emission source is only applicable if under the project activity wastewater is dewatered and directed to land application. For conservativeness, an MCF of 0.05 is to be used to estimate possible methane emissions from the land application treatment process to account for any possible anaerobic pockets. These emissions are to be estimated from the following equations:

$$PE_{ww,LA,y} = COD_{ww,LA,y} \times B_o \times MCF_{ww,LA} \times GWP_{CH4} + N_{ww,LA,y} \times EF_{N2O,LA,ww} \times GWP_{N2O}$$

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with

$$\text{COD}_{\text{ww,LA},y} = \sum_{m=1}^{12} \text{DWW}_{\text{LA},m} \times w_{\text{ww,COD,LA},m} \quad \text{and}$$

$$\text{N}_{\text{ww,LA},y} = \sum_{m=1}^{12} \text{DWW}_{\text{LA},m} \times w_{\text{N,ww},m}$$

Where:

$\text{PE}_{\text{ww,LA},y}$	= Project emissions from land application of dewatered wastewater in year $y$ ( $\text{tCO}_2\text{e/yr}$ )
$\text{COD}_{\text{ww,LA},y}$	= Chemical oxygen demand (COD) of the wastewater applied to land after the dewatering process in year $y$ ( $\text{tCOD/yr}$ )
$B_0$	= Maximum methane producing capacity, expressing the maximum amount of $\text{CH}_4$ that can be produced from a given quantity of chemical oxygen demand ( $\text{tCH}_4/\text{tCOD}$ )
$\text{MCF}_{\text{ww,LA}}$	= Methane conversion factor for the application of wastewater to lands
$\text{GWP}_{\text{CH}_4}$	= Global Warming Potential of methane valid for the applicable commitment period ( $\text{tCO}_2\text{e/tCH}_4$ )
$\text{W}_{\text{ww,COD,LA},m}$	= Average chemical oxygen demand in the dewatered wastewater in month $m$ ( $\text{t COD/t dewatered wastewater}$ )
$\text{DWW}_{\text{LA},m}$	= Amount of dewatered wastewater applied to land in month $m$ ( $\text{t/month}$ )
$\text{N}_{\text{ww,LA},y}$	= Amount of nitrogen in wastewater applied to land in year $y$ ( $\text{t N/yr}$ )
$\text{w}_{\text{N,ww},m}$	= Mass fraction of nitrogen in the wastewater applied to land in month $m$ ( $\text{t N/t dewatered wastewater}$ )
$\text{EF}_{\text{N}_2\text{O,LA,ww}}$	= $\text{N}_2\text{O}$ emission factor for nitrogen from wastewater applied to land ( $\text{t N}_2\text{O/t N}$ )
$\text{GWP}_{\text{N}_2\text{O}}$	= Global Warming Potential of nitrous dioxide ( $\text{tCO}_2\text{e/tN}_2\text{O}$ )

## *(vi) Project emissions from electricity consumption and combustion of fossil fuels in the project*

This emission source includes  $\text{CO}_2$  emissions from the consumption of electricity or combustion of fossil fuels for the operation of the project activity. This may, for example, include the operation of pumps. CPA's included in this PoA will not combust fossil fuels. Hence, equations for fossil fuel combustion are omitted.

If electricity is generated with biogas under the project activity, the electricity consumption for the operation of the project activity should be subtracted from the total on-site electricity generation with biogas in calculating  $\text{EG}_{\text{PJ},y}$  (i.e.  $\text{EG}_{\text{PJ},y}$  only includes the *net* electricity generation resulting from the project activity). Otherwise, the latest approved version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 1) should be applied to calculate project emissions from electricity consumption ( $\text{PE}_{\text{EC},y}$ ).

Scenario A, electricity consumption from the grid will apply whereby no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exists, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Project, baseline and leakage emissions from consumption of electricity are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor to account for transmission losses, as follows:

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$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$$

Under Scenario A where the electricity consumption is from the grid, thereby the source, j is the electricity grid.

- $EC_{PJ,j,y}$  = Quantity of electricity consumed by the project electricity consumption sourced from the grid (MWh/yr)
- $EF_{EL,j,y}$  = Emission factor for electricity generation sourced from the grid in year y (tCO<sub>2</sub>/MWh). This is calculated following the "Tool to calculate the emission factor for an electricity system", (Version 2.2.1), outlined previously
- $TDL_{j,y}$  = Average technical transmission and distribution losses for providing electricity to source j in year y, applying the default value of 20%

The equations above will be applied on a case by case basis and documented in the CPA-DD.

Based on the document review of section E.6 in PoA-DD, validation team confirms that all the formulae required to calculate the different components of the project emissions are transparently presented in line with the applied methodology and Tools.

## Leakage emission of a typical CPA:

Leakage emissions are only calculated for Scenario 1 type projects that include the treatment of solid materials in the digester in the project activity, and identified baseline scenario for the treatment of solid materials in the "Procedure for the identification of the most plausible baseline scenario" is SM2: The solid materials are used as animal fodder.

In such case, the potential source of leakage emission is the CO<sub>2</sub> emissions related to the production of additional animal fodder (or feed) that would be required in the project scenario due to the diversion of solid materials that were used as animal fodder in the baseline scenario, as a result of the project activity.

For this purpose, project participants shall assess the supply situation for the types of solid materials (suitable for animal fodder) in the region. Project participants may, however, rule out the leakage emissions, if they demonstrate that the use of the solid materials in the project activity does not result in CO<sub>2</sub> emissions elsewhere for the production of additional animal fodder, by one of the options below:

- L1: Demonstrate that there is an abundant surplus of the solid materials in the region of the project activity which are not utilized. For this purpose, demonstrate that the quantity of available solid materials in the region is at least 25% larger than the quantity that is utilized for animal fodder;
- L2: Demonstrate that suppliers of the solid materials in the region of the project activity are not able to sell all of their solid materials. For this purpose, project participants shall demonstrate that both project entity as well as a representative sample of producers of the same type of solid materials in the region, had a surplus of these solid materials (e.g. at the end of the period during which solid materials are sold), which they could sell and which is not utilized.

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When project participants wish to use approaches L1 or L2 to rule out leakage emissions, they shall clearly define the geographical boundary of the region and document it in the CPA-DD. In defining the geographical boundary of the region, project participants should take the usual distances for animal fodder transports into account, i.e. if animal fodder is transported up to 50 km, the region may cover a radius of 50 km around the project activity. In any case, the region should cover a radius around the project activity of at least 20 km but not more than 200 km.

If project participants are not able to rule out the leakage emissions using one of the approaches above, a leakage penalty shall be applied. This leakage penalty shall be calculated for each year  $y$  as follows:

$$LE_y = \sum_k EF_{CO2,k,LE} \times SM_{PJ,k,y} \times NCV_k \quad \text{and}$$

$$EF_{CO2,k,LE} = \sum_i f_i \times EF_i$$

Where:

- $LE_y$  = Leakage emissions during the year  $y$  (tCO<sub>2</sub>/yr)
- $EF_{CO2,k,LE}$  = CO<sub>2</sub> emission factor of production of animal fodder that is used to replace the solid materials type  $k$  (tCO<sub>2</sub>/GJ)
- $SM_{PJ,k,y}$  = Quantity of solid materials type  $k$  that are displaced as animal fodder as a result of the project activity during the year  $y$  (tons of dry matter)
- $K$  = Types of solid materials for which leakage effects could not be ruled out with one of the approaches L1 or L2 above
- $NCV_k$  = Net calorific value of the solid materials type  $k$  (GJ/ton)
- $f_i$  = Fraction of total calorific value of animal feed type  $i$ , compared to the total calorific value of all animal feed, which is used to replace the solid materials (%)
- $EF_i$  = Specific production emission factor of type of animal feed  $i$  which is used to replace the solid materials (tCO<sub>2</sub>/GJ)
- $I$  = Types of different animal feeds which are used to replace the solid materials

Alternatively, given the potential complexity of the above procedure, the leakage penalty may be calculated by applying a simple yet conservative alternative:

$$LE_y = \sum_k SM_{PJ,k,y} \times D$$

Where:

- $LE_y$  = Leakage emissions during the year  $y$  (tCO<sub>2</sub>/yr)
- $SM_{PJ,k,y}$  = Quantity of solid materials type  $k$  that are displaced as animal fodder as a result of the project activity during the year  $y$  (tons of dry matter)
- $D$  = Default value of 1 tCO<sub>2</sub> / ton of dry matter

Note that the default value can only be used in case the production of animal fodder in the region does not have an impact on deforestation. In case deforestation is likely to occur, this needs to be included and a region specific emission factor for animal fodder production needs to be estimated according to formula 32 of the methodology.

The equations above will be applied on a case by case basis and documented in the CPA-DD.

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## Emission Reductions of a typical CPA:

Emission reductions for any given year of the crediting period are calculated by subtracting project emissions from baseline emissions.

$$ER_y = BE_y - PE_y - LE_y$$

Where:

- $ER_y$  = Emissions reductions of the project activity in year  $y$  (tCO<sub>2</sub>e/year)
- $BE_y$  = Baseline emissions in year  $y$  (tCO<sub>2</sub>e/year)
- $PE_y$  = Project emissions in year  $y$  (tCO<sub>2</sub>e/year)
- $LE_y$  = Leakage emissions in year  $y$  (tCO<sub>2</sub>e/year)

The following parameters are *ex-ante* determined values:

Table: 4.7: *Ex-ante* paramters to be included in the CPA based on site specific conditions.

Parameter	Description	Validation comment
$COD_{out,x}$ $COD_{in,x}$  tCOD/unit of time (year, month)	$COD_{out,x}$ = COD of the effluent in the period $x$ $COD_{in,x}$ = COD directed to the open lagoons (Scenario 1) in the period $x$	As per the applied methodology <sup>/2/</sup> : For existing plants: one year of historical data. If no data is available the COD inflow to and effluent from the lagoon during a measurement campaign of at least 10 days. For Greenfield projects: use the design COD inflow for COD in and the design effluent COD flow for COD out corresponding to the design features of the lagoon system identified in the procedure for the selection of the baseline scenario. The measurements should be undertaken during a period that is representative for the typical operation conditions of the plant and ambient conditions of the site (temperature, etc). The average $COD_{in}$ and $COD_{out}$ values from the measurement campaign shall be used in equation 4 and the result shall be multiplied by 0.89 to account for the uncertainty range (of 30% to 50%) associated with this approach as compared to one-year historical data. It has to be noted that this data would be determined for each CPA during its inclusion.
$B_o$  tCH <sub>4</sub> /tCOD	Maximum methane producing capacity, expressing the maximum amount of CH <sub>4</sub> that can be produced from a given quantity of chemical oxygen demand (COD)	As per the applied methodology <sup>/2/</sup> : Default IPCC value for $B_o$ is 0.25 kg CH <sub>4</sub> /kg COD, but value of 0.21 kg CH <sub>4</sub> /kg COD is used as a conservative assumption for $B_o$ . If the methodology is used for wastewater containing materials not akin to simple sugars, a CH <sub>4</sub> emissions factor different from 0.21tCH <sub>4</sub> /tCOD has to be estimated and applied.
$f_d$  -	Factor expressing the influence of the depth of the lagoon or sludge pit on methane generation	As per the applied methodology <sup>/2/</sup> , following values for the corresponding average depth of the open lagoon Depth > 5 m: 70% Depth 1 – 5 m: 50% Depth < 1 m: 0% Applicable to the methane conversion factor method.

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		In the case of projects activities implemented in Greenfield facilities where the baseline is a new to be built anaerobic lagoon, use the depth as defined in the baseline lagoon design in the section "Identification of alternative scenarios"
$f_{\text{COD,aerobic}}$ t COD/ha yr	Quantity of chemical oxygen demand degraded to $\text{CO}_2$ under aerobic conditions per surface area of the lagoon or sludge pit	As per the applied methodology <sup>/2/</sup> , default value is 92.7 t COD / ha yr ( 254 kg COD/ha day) applied. Applicable to the organic removal ratio method
D m	Average depth of the lagoon or sludge pit	As per the applied methodology <sup>/2/</sup> : For existing plants: Conduct measurements For project activities implemented in Greenfield facilities: As per the baseline lagoon design as identified in Step 1 of the section "Procedure for the identification of the most plausible baseline scenario Identification of alternative scenarios" Determine the average depths of the whole lagoon under normal operating conditions.
$\text{EC}_{\text{BL}}$ MWh/yr	Annual quantity of electricity that would be consumed in the absence of the project activity for the treatment of the wastewater (Scenario 1)	As per the applied methodology <sup>/2/</sup> : For existing plants: Historical records of the average electricity during the most recent three years prior to the implementation of the project activity; For Greenfield facilities: according to the baseline lagoon design as identified in Step 1 of the section "Procedure for the identification of the most plausible baseline scenario" Historical records must correspond to measurements whereby electricity meters undergo maintenance/calibration subject to appropriate industry standards. The accuracy of the meter readings will be verified by receipts issued by the purchasing power company. Uncertainty of the meters to be obtained from the manufacturers. Only relevant if electricity emissions are included in the baseline.

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$EF_{grid,y}$ $EF_{BL,EL,y}$  Unit: tCO <sub>2</sub> /MWh	$EF_{grid,y}$ = Grid emission factor in year y $EF_{BL,EL,y}$ = Baseline emission factor for electricity generated and/or consumed in the absence of the project activity in year y	It will be calculated in accordance with the latest approved version of the "Tool to calculate the emission factor for an electricity system", Version 2.2.1, EB63 <sup>/7/</sup> .
$EF_{CO2,FF,captive}$ $EF_{CO2,FF,boiler}$  Unit: tCO <sub>2</sub> /GJ	$EF_{CO2,FF,captive}$ = CO <sub>2</sub> emission factor of the fossil fuel type used in the captive power plant $EF_{CO2,FF,boiler}$ = CO <sub>2</sub> emission factor of the fossil fuel type used in the boiler for heat generation in the absence of the project activity	As per the applied methodology <sup>/2/</sup> : measured or local data is to be used. If not available, regional data should be used and, in its absence, IPCC defaults can be used from the most recent version of IPCC Guidelines for National Greenhouse Gas Inventories. Only relevant if baseline emissions from captive power (electricity/heat) sources are calculated. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements. Double-checked against IPCC defaults (for consistency) if data is local or regional.
$\eta_{EL,captive}$ $\eta_{BL,boiler}$  Unit: %	$\eta_{EL,captive}$ = Efficiency of the fossil fuel fired captive power plant $\eta_{BL,boiler}$ = Efficiency of the boiler that would be used for heat generation in the absence of the project activity	As per the applied methodology <sup>/2/</sup> : , depending on the chosen option, the source will be either of the following: <ul style="list-style-type: none"> <li>• Measured efficiency prior to project implementation;</li> <li>• Measured efficiency during monitoring;</li> <li>• Manufacturer nameplate data for efficiency of the existing equipment</li> </ul> Only relevant if baseline emissions from captive power (electricity/heat) sources are calculated.
$FL_{biogas,digest}$  Unit: m <sup>3</sup> biogas leaked/m <sup>3</sup> biogas produced	Fraction of biogas that leaks from the digester	As per the applied methodology <sup>/2/</sup> : default leak factor of 0.05 m <sup>3</sup> biogas leaked/m <sup>3</sup> biogas produced is applied.
$EF_{N2O,LA,sludge}$  Unit: t N <sub>2</sub> O/t N	N <sub>2</sub> O emission factor for nitrogen from sludge applied to land	As per the applied methodology <sup>/2/</sup> : Stehfest, E. and Bouwman, A.F. N <sub>2</sub> O and NO emission from agricultural fields and soils under natural vegetation: summarizing available measurement data and modelling of global annual emissions. Nutr. Cycl. 29 Agroecosyst., in press. The average emission factor used is 0.01 kg N <sub>2</sub> O-N / kg N (= 0.016 kg t N <sub>2</sub> O/t N) Applicable if sludge is applied on lands under the project activity
$EF_{N2O,LA,ww}$  Unit: t N <sub>2</sub> O/t N	N <sub>2</sub> O emission factor for nitrogen from wastewater applied to land	As per the applied methodology <sup>/2/</sup> : Stehfest, E. and Bouwman, A.F. N <sub>2</sub> O and NO emission from agricultural fields and soils under natural vegetation: summarizing available measurement data and modelling of global annual emissions. Nutr. Cycl. 29 Agroecosyst., in press. The average emission factor used is 0.01 kg N <sub>2</sub> O-N / kg N (= 0.016 kg t N <sub>2</sub> O/t N) Applicable if sludge is applied on lands under the project activity

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MCF <sub>sludge,LA</sub> Unit: -	Methane conversion factor for the application of sludge to lands	0.05 as per the applied methodology <sup>/2/</sup> . Applicable if sludge is applied on lands under the project activity
MCF <sub>ww,LA</sub> Unit: -	Methane conversion factor for the application of wastewater to lands	0.05 as per the applied methodology <sup>/2/</sup> .
GWP <sub>CH4</sub> Unit: tCO <sub>2</sub> e/tCH <sub>4</sub>	Global warming potential for CH <sub>4</sub>	21 as per the applied methodology <sup>/2/</sup> . Shall be updated according to any future COP/MOP decisions
GWP <sub>N<sub>2</sub>O</sub> Unit: tCO <sub>2</sub> e/tN <sub>2</sub> O	Global warming potential for N <sub>2</sub> O	296 as per the applied methodology <sup>/2/</sup> . Shall be updated according to any future COP/MOP decisions
Rs Unit: t COD/ t substance	Specific reduction in chemical oxygen demand by substance s	The most conservative default value from review of published literature would be used as per the applied methodology <sup>/2/</sup> . Substance is very likely to be SO <sub>4</sub>
A Unit: Unit of area (ha)	Surface of the lagoon	As per the applied methodology <sup>/2/</sup> : in case of existing lagoons : actual measurements in case of project activities implemented in Greenfield facilities: According to the baseline lagoon design as identified in Step 1 of the section "Procedure for the identification of the most plausible baseline scenario"
EF <sub>i</sub> Unit: tCO <sub>2</sub> /GJ	Specific production emission factor of type of animal feed which is used to replace the solid materials	As per the applied methodology <sup>/2/</sup> : relevant emission factors based on lifecycle analysis studies, for type <i>i</i> of animal feed used to replace the solid materials (e.g. from scientific literature, industry sources or manufacturers). Alternatively, identify average lifecycle emissions per animal feed produced (e.g. calculations based on national/international statistics or estimated by external research institutes or national agencies responsible for GHG inventory). Applicable if leakage occurs due to displacement of animal fodder. In case the production of animal fodder in the region has an impact on deforestation, emissions associated with the deforestation need to be included in the estimations
f <sub>i</sub> Unit: Fraction GJ/GJ (%)	Fraction of animal feed type <i>i</i> compared to the total mix of animal feed which is used to replace the solid materials on dry basis	As per the applied methodology <sup>/2/</sup> : Interviews with existing customers of solid materials type <i>k</i> and/or regional/national market statistics on animal feed use, which can be statistically significant (representative sampling with 95% confidence interval) Applicable if leakage occurs due to displacement of animal fodder. In case of variation in the data, apply a conservative approach (i.e. the largest fraction for the most GHG intensive animal fodder etc.)
NCV <sub>k</sub>	Net calorific value of the solid materials type <i>k</i>	As per the applied methodology <sup>/2/</sup> : measurements shall be carried out at qualified laboratories and according to relevant

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Unit: GJ/ton of dry matter		national or international standards. Measure the NCV based on dry matter. Applicable if leakage occurs due to displacement of animal fodder
TDL <sub>j,y</sub>  Unit: -	Average technical transmission and distribution losses for providing electricity to source <i>j</i>	20%. This is the default value provided in the applied "Tool to calculate baseline, project and/or leakage emissions from electricity consumption, Version 01, EB39" <sup>/10/</sup> .

For the data and parameters not to be monitored throughout the crediting period (i.e. they are determined only once and thus remain fixed throughout the crediting period), it is assessed that all data sources, assumptions and calculations are correct, applicable to the scope of the PoA and contribute to a conservative estimate of the emission reductions.

Validation team has noted that the PoA-DD contains a transparent statement that the CPA-DD shall contain information regarding greenhouse gas emissions occurring within the proposed CPA project activity boundary as a result of the implementation of the proposed CPA which are expected to contribute more than 1% of the overall expected average annual emissions reductions, which are not addressed by the applied methodology. This is inline with para 77 of the applied version of the validation and verification manual <sup>/6/</sup>.

All values and descriptions used in the PoA-DD <sup>/36/</sup> to calculate emission reductions are considered reasonable in the context of the PoA and calculation approach is correct.

Nonetheless, it is reiterated that the methodological choices used to determine the calculation methods for baseline, project and leakage emissions will be applied on a case by case basis to each CPA depending on the baseline scenario, project design and technology details for each CPA. The methodological choices, together with the emissions reductions calculation, will be documented in the CPA-DD, review by the CME as part of the CPA inclusion process, and further cross-checked by the contracted DOE during validation. For 1<sup>st</sup> CPA, please refer to GLC's corresponding validation report.

## 4.9 Additionality of the Programme of Activity and of a typical CPA

GLC confirms that: with the framework as defined in the PoA-DD and criteria for inclusion of CPAs, additionality has been/will be demonstrated by establishing that in the absence of the CDM, none of the implemented CPAs would have occurred. The approach to demonstrate additionality as defined in the PoA-DD <sup>/36/</sup> is summarised below:

In line with the methodology ACM0014 (Version 4.1.0) <sup>/2/</sup>, the additionality for activities under this PoA will be demonstrated at CPA level in accordance with the latest version of the "Tool for the demonstration and assessment of additionality" (at the time of drafting the PoA-DD Version 06.0.0) <sup>/5/</sup>, and in doing so, ensure consistency with the guidance provided in the "Procedure for the identification of the most plausible baseline scenario" of ACM0014. A common practise analysis will also be applied as necessary. These aspects are addressed in Section E.5.1 and E.5.2 of the PoA-DD <sup>/36/</sup>.

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The decision to demonstrate additionality on CPA level is governed by the variability of factors that affect the possible investment or barrier analysis. Over time, factors like investment cost and exchange rates may vary to an extent that makes the investment analysis presented in the PoA void. Similarly for barrier analysis, the state of political, market, technological and investment barriers may change significantly over the length of the PoA. The justification provided is deemed as reasonable and can be accepted by GLC.

Section A.4.2.2 of the PoA-DD transparently includes the additionality tool requirements as a part of the eligibility criteria (criterion #12). It is transparently provided that the CPA should meet the relevant requirements of "Guidelines on the assessment of investment analysis" <sup>/11/</sup> (Version 5.0.0), "Guidelines for objective demonstration and assessment of barriers" <sup>/13/</sup> (Version 1.0), whereby compliance with the these requirements shall be recorded in the CPA-DD and the supporting documents to justify the same shall be submitted and validated by the contracted DOE. Validation team confirms this is complying with "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities" <sup>/31/</sup> (EB 65 report, Annex 3).

Section E.5 of the PoA-DD <sup>/36/</sup> is presented adequately to provide the approach to demonstrate the additionality as per the tool.

It is provided in the PoA-DD <sup>/36/</sup> that:

**Applicable geographical area** covers the entire host country as a default. This is the definition to be applied within each CPA.

**Measure** (for emission reduction activities) is a broad class of greenhouse gas emission reduction activities possessing common features. The applicable measure for this CPA is:

(c) Methane destruction;

**Output** is goods or services with comparable quality, properties, and application areas. The output will be selected based on the design flow diagram of each individual CPA. Outputs included in this PoA could be one or more of the following: methane recovery and flaring, electricity provided to the grid, electricity provided to a dedicated user and heat provided to a dedicated user.

**Different technologies** in the context of common practice are technologies that deliver the same output and differ by at least one of the following (as appropriate in the context of the measure applied in the proposed CDM project and applicable geographical area):

(a) Energy source/fuel;

(b) Feed stock;

(c) Size of installation (power capacity):

(i) Micro (as defined in paragraph 24 of Decision 2/CMP.5 and paragraph 39 of Decision 3/CMP.6);

(ii) Small (as defined in paragraph 28 of Decision 1/CMP.2);

(iii) Large.

(d) Investment climate in the date of the investment decision, inter alia:

- (i) Access to technology;
- (ii) Subsidies or other financial flows;
- (iii) Promotional policies;
- (iv) Legal regulations.

(e) Other features, inter alia:

- (i) Unit cost of output (unit costs are considered different if they differ by at least 20 %);

The above is assessed as appropriate and in compliance with the additionality tool <sup>/5/</sup>.

The additonality tool contains the following steps:

- (a) Identification of alternatives to the project activity; and
- (b) Investment analysis to determine that the proposed project activity is either: 1) not the most economically or financially attractive, or 2) not economically or financially feasible;
- (c) Barriers analysis; and
- (d) Common practice analysis.

It is noted that as per the additionality tool each CPA can choose to either apply investment analysis or barrier analysis or both.

Assessment of each step is provided in sections 4.9.2 to 4.9.5 below.

## 4.9.1 Prior Consideration of the Clean Development Mechanism

The Board agreed that the Guidelines for the demonstration and assessment of prior consideration of the CDM do not apply to PoAs, as at present it is expected that no component of the programme will commence prior to the start date of validation (EB 60, Annex 26) <sup>/3/</sup>. Therefore the PoA is exempted from assessment of prior consideration of the CDM according to EB 60 Annex 26 <sup>/3/</sup>. Besides, it has been included in one eligibility criteria for all CPAs to confirm their start date to be after the PoA GSC date 21/12/2011.

## 4.9.2 Step 1: Identification of alternatives of the project activity consistent with the current laws and regulations.

As per the PoA-DD, this step shall be applied following para 15-21 of the additionality tool <sup>/5/</sup>. This is assessed as appropriate for projects applying large-scale methodologies as is the case of this PoA.

As pertinently referred by the PP in the PoA-DD <sup>/36/</sup>, according to the 'Guidelines for Completing CDM PDDs V7.0 (EB41) <sup>/32/</sup> Section B.4 and B.5 (in the case of CPA-DDs Section B.2 and B.3) are complimentary and the same information need not be replicated in both sections. The approach is assessed as reasonable and can be accepted.

It has to be noted that the identification of alternatives consistent with the current laws and regulations would be determined specifically for each CPA based on its specific conditions. The same shall be presented in the CPA-DD, review by the the CME as part of the CPA inclusion process, and further cross-checked by the contracted DOE during validation. For 1<sup>st</sup> CPA, please refer to GLC's corresponding validation report.

## 4.9.3 Step 2: Investment Analysis

As per the PoA-DD, this step shall be applied following para 22-35 of the additionality tool <sup>/5/</sup>, which is noted as also require taking into account "Guidelines on the assessment of investment analysis" (Version 5.0) <sup>/11/</sup>. This is assessed as appropriate for projects applying large-scale methodologies as is the case of this PoA.

For each CPA, it shall be determined whether to apply simple cost analysis, investment comparison analysis or benchmark analysis (Sub-step 2b).

Financial or economic indicator will be identified based on the project type and decision context. Section E.5 of the PoA-DD <sup>/36/</sup> has provided adequate description to demonstrate the applicability of the investment analysis. Validation team has reviewed section E.5 of the PoA-DD <sup>/36/</sup> and confirms that the provided description is inline with the applied additonality tool. It is also noted that the additonality will be demonstrated at the CPA level and validated by contracting DOE. For 1<sup>st</sup> CPA, please refer to GLC's corresponding validation report.

## 4.9.4 Step 3: Barrier Analysis

As per the PoA-DD, this step shall be applied following para 36-42 of the additionality tool <sup>/5/</sup>, which is noted as also require taking into account "Guidelines for objective demonstration and assessment of barriers" <sup>/13/</sup> (Version 1.0). This is assessed as appropriate for projects applying large-scale methodologies as is the case of this PoA.

Section E.5 of the PoA-DD <sup>/36/</sup> contains the relevant description of the demonstration of the barrier analysis, which is found in line with the relevant requirements of the additionality tool <sup>/5/</sup>.

It is highlighted again that for the purpose of additionality demonstration, each CPA can choose to either apply investment analysis, or barrier analysis, or both as deemed appropriate.

The additonality will be demonstrated at the CPA level and validated by contracting DOE. For 1<sup>st</sup> CPA, please refer to GLC's corresponding validation report.

## 4.9.5 Step 4: Common Practice Analysis

Validation team has reviewed the description provided to demonstrate the common practice analysis and confirm that the CME has made a transparent description in line with the applied latest version of the additionality tool <sup>/5/</sup> as follows:

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Since each CPA will implement a measure listed in paragraph 6 of the Additionality Tool <sup>/5/</sup>; therefore additionality is determined through the following four steps:

*Step 1: Calculate applicable output range as +/-50% of the design output or capacity of the proposed CPA.*

*Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number  $N_{all}$ . Registered CDM project activities and projects activities undergoing validation shall not be included in this step;*

*Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number  $N_{diff}$ .*

*Step 4: Calculate factor  $F=1-N_{diff}/N_{all}$  representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.*

*The proposed CPA is a common practice within a sector in the applicable geographical area if both the following conditions are fulfilled:*

- (a) the factor  $F$  is greater than 0.2, and*
- (b)  $N_{all}-N_{diff}$  is greater than 3.*

It is pertinent to note that as stipulated in the PoA-DD <sup>/36/</sup>, the assessment of common practice analysis, the key criteria to be applied shall be in accordance with paragraphs 6, 7, 8, 9 and 47 of the additionality tool <sup>/5/</sup>.

In all, validation team concludes that the description in the PoA-DD <sup>/36/</sup> provides completely and adequately the various steps required by the additionality tool <sup>/5/</sup> that will be applied at the CPA level.

## 4.10 Global and Local Stakeholder Consultations

Germanischer Lloyd Certification GmbH published the project documents (PoA-DD, CPA-DD generic and CPA-DD specific) <sup>/1/</sup> on UNFCCC's website at:

(<http://cdm.unfccc.int/ProgrammeOfActivities/Validation/DB/AUF862OKSITP28IH3KRH5HNKAWTSEO/view.html>) on 21/12/2011 and invited comments within the period from 21/12/2011 to 19/01/2012 by Parties, stakeholders and Non-Governmental Organisations. No comments were received.

Local stakeholder consultation is chosen by PP to be done at CPA level, which is deemed appropriate, since each CPA implemented as part of the PoA will have specific stakeholders which cannot be adequately consulted at the PoA level, but more representative at CPA level.

## 4.11 Environmental Impacts Analysis (EIA)

Based on the document review and onsite interviews, validation team confirms that the environmental analysis will be performed at the CPA level, which is deemed appropriate, since the individual CPAs will vary in their design and this will enable the specific local impacts to be analysed. It is to be noted that the individual CPAs will have different designs and this will enable the specific local impacts to be analysed. As outlined in the PoA-DD <sup>/36/</sup> section C.1, environmental analysis will be performed in accordance with the requirements of the Host Government, including the guidelines of the DNA.

It is noted that renewable biogas plants are not designated as a project type required to complete an Environmental Impact Assessment (EIA) (as per the "Notification on type and size of project or enterprise that must report an environmental impact assessment" dated 16 June 2009 and published in the Government Gazette dated 31 August 2009 <sup>/19/</sup>). Therefore, a typical CPA is not required to perform an EIA within Thailand. Nonetheless, it is noted that all CPAs which although are not specifically required to perform an EIA must complete and submit a simpler evaluation of the environmental impacts in the form of Initial Environmental Evaluation (IEE) report to TGO as per host country procedures. For the 1<sup>st</sup> CPA, the same was submitted and approved by TGO as evidence in the receipt of letter of approval <sup>/39/</sup>.

## 5 VALIDATION OPINION

Germanischer Lloyd Certification GmbH has performed a validation of TBEC Biogas Programme for South East Asia with its first CPA in Thailand. The validation was performed on the basis of UNFCCC criteria and PoA host country criteria, as well as criteria given to provide consistent project operations, monitoring and reporting.

The PoA applies (ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" version 04.1.0). The methodology has been correctly applied and the assumptions made for the selected baseline scenario are sound.

By capturing and destructing the methane from the wastewater to produce the renewable electricity, the first CPA results in reduction of 21,279 t CO<sub>2</sub>eq emissions per year that are real, measurable and give long-term benefits to the mitigation of climate change. Given that the 1<sup>st</sup> CPA is implemented as designed, the project is likely to achieve the estimated amount of emission reductions. It is sufficiently demonstrated that the 1<sup>st</sup> CPA is not a likely baseline scenario and that emission reductions attributable to the project are additional to any that would occur in the absence of the project activity. No relevant negative environmental impacts are expected from the implementation of the 1<sup>st</sup> CPA. A global and local stakeholder consultation was conducted for the PoA and the 1<sup>st</sup> CPA.

In summary, it is GLC's opinion that the TBEC Biogas Programme for South East Asia with its first CPA in Thailand as described in the revised project design document <sup>/36/</sup> (developed in consistent with CPA-DD generic) meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" version 04.1.0.

The review of the PoA design documentation and the subsequent follow-up interviews have provided Germanischer Lloyd Certification GmbH with sufficient evidence to determine the fulfilment of stated criteria. In our opinion, the PoA meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria. The PoA is therefore recommended by Germanischer Lloyd Certification GmbH for registration.

Hamburg, 2012-08-30

**Germanischer Lloyd**  
Certification

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## 6 REFERENCES

The following table outlines the documentation reviewed during the validation:

Ref. No.	TITLE of DOCUMENT or EVIDENCE (Author, website link)	EB Ref. / DATE
/1/	PoA-DD "TBEC Biogas Programme for South East Asia", generic CPA-DD and specific CPA-DD version 1 uploaded for GSC at: <a href="http://cdm.unfccc.int/ProgrammeOfActivities/Validation/DB/AUF862OKSITP28IH3KRH5HNKAWTSEO/view.html">http://cdm.unfccc.int/ProgrammeOfActivities/Validation/DB/AUF862OKSITP28IH3KRH5HNKAWTSEO/view.html</a>	21/12/2011 (GSC start date)
/2/	CDM –EB: ACM0014"Mitigation of greenhouse gas emissions from treatment of industrial wastewater" version 04.1. available at <a href="http://cdm.unfccc.int/methodologies/DB/9UTPHY7IOWUZ4Q8S30Q0WQ7OS4P8PR">http://cdm.unfccc.int/methodologies/DB/9UTPHY7IOWUZ4Q8S30Q0WQ7OS4P8PR</a>	26/11/2010
/3/	CDM –EB: Clarification Regarding the Procedures for Registration of a PoA as a single CDM Project Activity and Issuance of CERs for a PoA, version 01. (EB 60, Annex 26) <a href="http://cdm.unfccc.int/Reference/Guidclarif/PoA/poa_guid06.pdf">http://cdm.unfccc.int/Reference/Guidclarif/PoA/poa_guid06.pdf</a>	15/04/2011
/4/	CDM –EB: Methodological "Tool to determine project emissions from flaring gases containing methane", Annex 13, EB 28.	NA
/5/	CDM –EB: "Tool for the demonstration and assessment of additionality". (Version 06.0.0)	25/11/2011
/6/	CDM –EB :EB 55, Annex 1 <a href="http://cdm.unfccc.int/UserManagement/FileStorage/18Y54N6CWUV2LOESXQP3RMBID9FHK">Clean Development Mechanism Verification and Validation Manual (version 01.2)</a> <a href="http://cdm.unfccc.int/UserManagement/FileStorage/18Y54N6CWUV2LOESXQP3RMBID9FHK">http://cdm.unfccc.int/UserManagement/FileStorage/18Y54N6CWUV2LOESXQP3RMBID9FHK</a>	30/07/2010
/7/	CDM –EB : EB 63 report, Annex 19 Methodological tool "Tool to calculate the emission factor for an electricity system", version 02.2.1	29/09/2011
/8/	CDM –EB : EB 41 report, Annex 11 Methodological tool "Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion", version 02	02/08/2008
/9/	IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Reference Manual. 2006	2006
/10/	CDM –EB :Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 1, EB39 Annex 7)	16/05/2008
/11/	CDM –EB : EB62 Annex 5 Guidelines on the assessment of investment analysis (version 05)	15/07/2011
/12/	1. GLC's validation process : "DC-GHG_006_Validation_Process_Rev08.doc" 2. GLC's PoA Procedure: "DC-GHG 015 Programme of Activities Rev03.doc"	1. 19/03/2012 2. 19/03/2012
/13/	CDM –EB :EB 50 Annex 13 Guidelines for objective demonstration and assessment of barriers (Version 01)	16/10/2009.
/14/	TBEC : Emission Reduction Calculation Sheet for the first CPA, version 03.0	12/05/2012
/15/	TBEC : IRR calculation spread sheet for the first CPA, version 02.4	16/07/2012
/16/	CDM –EB: Guidelines for the demonstration and assessment of prior consideration of the CDM). <a href="http://cdm.unfccc.int/UserManagement/FileStorage/1QRAJGC0P2MWD48Z369INYOK7F5SET">http://cdm.unfccc.int/UserManagement/FileStorage/1QRAJGC0P2MWD48Z369INYOK7F5SET</a>	15/04/2011
/17/	TBEC :ODA declaration provided by the CME TBEC	15/05/2012
/18/	1. TBEC: CPA inclusion management system document version 01. 2. TBEC: CPA inclusion management system document version 02. 3. TBEC: CPA inclusion management system document version 02.1 4. TBEC : Extract of CME database v.1.0 5. TBEC : Extract of CME database v.1.1	1. May 2012 2. June 2012 3. August 2012 4. June 2012 5. August 2012
/19/	MONRE: Notification on the category and capacity of projects and enterprises that require preparation and submission of Environmental Impact Assessment Report	31/08/2009

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/20/	CDM –EB : EB 66 report, Annex 63 Glossary of CDM Terms, version 06.0	02/03/2012
/21/	TBEC : Company License of the CME :Thai Biogas Energy Company Limited	24/09/2003
/22/	1. CDM –EB :EB 63 Annex 2: <a href="http://cdm.unfccc.int/UserManagement/FileStorage/53IL4CJH82EFWGVTPMOYANUSBX697R">Standard for demonstration of additionality of GHG emission reductions achieved by a Programme of Activities</a> 2. CDM-EB: EB 63 Annex 3, Standard for the development of eligibility criteria for the inclusion of a project activity as a CPA under the PoA	29/09/2011
/23/	Francisco J. Cervantes, Spyros G. Pavlostathis, Adrianus C. van Handeel, 'Advanced biological treatment processes for industrial wastewaters, Principles and Applications' published by IWA (page 259)	2006
/24/	E. Roberts Alley, 'Water Quality Control Handbook 2007', published by McGraw Hill (page 10.65)	2007
/25/	MONRE: Notification No. 2 of the Thai Ministry of Industry (B.E. 2539) regarding discharge limits for industrial wastewater	1996
/26/	TBEC : Modalities of Communication of the PoA signed by the CME	18/07/2012
/27/	CDM –EB :EB 55 Annex 38 Procedure for registration of a programme of activities as a single project activity version 4.1 <a href="http://cdm.unfccc.int/Reference/Procedures/PoA_proc01.pdf">http://cdm.unfccc.int/Reference/Procedures/PoA_proc01.pdf</a>	02/08/2010
/28/	TBEC : Programme of activity plan of CME (TBEC) management system	11/01/2011
/29/	1. NEPC: Decision 3/2549 (no. 106)– Agenda 5, <a href="http://www.eppo.go.th/nepc/kpc/kpc-106.htm#5">http://www.eppo.go.th/nepc/kpc/kpc-106.htm#5</a> 2. EPC: Decision 6/2549 (no.17) – Agenda 2, <a href="http://www.eppo.go.th/nepc/kbg/kbg-17.htm">http://www.eppo.go.th/nepc/kbg/kbg-17.htm</a> 3. NEPC: Decision 5/2549 (no. 108) – Agenda 2, <a href="http://www.eppo.go.th/nepc/kpc/kpc-108.htm#2">http://www.eppo.go.th/nepc/kpc/kpc-108.htm#2</a> 4. NEPC: Decision 3/2550 (no. 112), dated– Agenda 1, <a href="http://www.eppo.go.th/nepc/kpc/kpc-112.htm#1">http://www.eppo.go.th/nepc/kpc/kpc-112.htm#1</a> 5. NEPC: Decision 8/2550 (no. 117), – Agenda 3, <a href="http://www.eppo.go.th/nepc/kpc/kpc-117.htm#3">http://www.eppo.go.th/nepc/kpc/kpc-117.htm#3</a> 6. PEA: Notification on provision of Adder for renewable energy based power producers under VSPP programme	1. 04/09/2006 2. 20/11/2006 3. 04/12/2006 4. 09/04/2007 5. 16/11/2007 6. 01/02/2007
/30/	CDM –EB :EXECUTIVE BOARD OF THE CLEAN DEVELOPMENT MECHANISM THIRTIETH MEETING Report <a href="http://cdm.unfccc.int/EB/030/eb30rep.pdf">http://cdm.unfccc.int/EB/030/eb30rep.pdf</a>	23/03/2007
/31/	CDM –EB : EB 65, Annex 3 Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for program of activities EB 65 Annex 3, available at <a href="http://cdm.unfccc.int/filestorage/E/6/T/E6TY7DMI28WGCUV5J0K3LAOHBQ9RFN/eb65_repan03.pdf?t=dm18bTZrbHhrfDBIU-Rn_R9BzQKhD8aXJthG">http://cdm.unfccc.int/filestorage/E/6/T/E6TY7DMI28WGCUV5J0K3LAOHBQ9RFN/eb65_repan03.pdf?t=dm18bTZrbHhrfDBIU-Rn_R9BzQKhD8aXJthG</a>	25/11/2011
/32/	CDM-EB : EB 41, Annex 12 Guidelines for Project Design Document (CDM-PDD) and the Proposed new baseline and monitoring methodologies (CDM-NM), available at <a href="http://cdm.unfccc.int/Reference/Guidclarif/pdd/PDD_guid04.pdf">http://cdm.unfccc.int/Reference/Guidclarif/pdd/PDD_guid04.pdf</a>	02/08/2008
/33/	CDM –EB : F-CDM-PoA-DD - Programme design document form for CDM programmes of activities; available at <a href="http://cdm.unfccc.int/Reference/PDDs_Forms/PoA/PoA_form04_v01.pdf">http://cdm.unfccc.int/Reference/PDDs_Forms/PoA/PoA_form04_v01.pdf</a>	NA
/34/	CDM –EB :F-CDM-CPA-DD - Component project activity design document form: available at <a href="http://cdm.unfccc.int/Reference/PDDs_Forms/PoA/PoA_form03_v01.pdf">http://cdm.unfccc.int/Reference/PDDs_Forms/PoA/PoA_form03_v01.pdf</a>	NA
/35/	CDM-EB: Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios, version 02	EB 22 Annex 3
/36/	Final PoA-DD "TBEC Biogas Programme for South East Asia " version 3.4	16/08/2012
/37/	Final specific CPA-DD "TBEC Biogas Programme for South East Asia CPA#0001 BSW", version 04.4	16/08/2012

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/38/	Final generic CPA-DD "TBEC Biogas Programme for South East Asia CPA#[Insert CPA Number & CPA Descriptor]"	NA
/39/	TGO: LoA of the PoA (ref: TGO No.02/759)	26/07/2012

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## ANNEX A: VALIDATION QUESTIONNAIRE AND RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS (FINDINGS'S LIST)

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TABLE 1: VALIDATION QUESTIONNAIRE

CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
A. General description of programme of activities (PoA)				
A.1. Title of the Programme of Activities (PoA)				
A.1.1. Are title, current version number and the date of document completion given in section A.1 of the PoA-DD?	PoA-DD EB41 Annex 12	Yes, the title, current version number and the date of document completion has been given in Section A.1 of the published PoA-DD, and specified as follows during the GSC stage: "TBEC biogas programme for South East Asia Version: 01.1. Date: 16/12/2011"  Nevertheless, final version of the PoA-DD at the time of submission for request for registration will need to be updated.	OK	OK
Has the PoA-DD been prepared in accordance with the latest template and guidance from the EB? <i>Please refer also to <a href="http://cdm.unfccc.int/Reference/PDDs_Forms/PoA/index.html">http://cdm.unfccc.int/Reference/PDDs_Forms/PoA/index.html</a></i>	EB 55 Annex 1, §55	Yes, the PoA-DD has been prepared according to the latest template available on the UNFCCC website (i.e. CDM-POA-DD, version 01).	OK	OK
A.2. PROGRAMME DESIGN DOCUMENT (PoA-DD) and DESCRIPTION of the PROGRAMME of ACTIVITY				
A.2.1. Has a sufficient description of general operating and implementing framework of the PoA been given in Section A.2 of the PoA-DD? E.g., the roles, functions and interrelations of CME, CPA implementer, project owner, end users and any other PPs or third parties directly involved in the operation or implementation of the PoA and CPAs, etc.	EB 55 Annex 38, § 6	General operating and implementing framework of the PoA has been described in Section A.2 of the published PoA-DD. It is clear that the PoA will be operated by Thai Biogas Energy Company ("TBEC"), who is the Coordinating/Managing Entity ("CME"), responsible for identifying suitable projects to be included as CDM Programme Activities ("CPAs") under the PoA. However, the following points are raised regarding the deficiencies in the description of general operating and implementing framework of	PoA-CAR 4	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
		<p>the PoA:</p> <ul style="list-style-type: none"> <li>The published PoA DD stated that the PoA is not restricted to CPAs under direct management of TBEC. However, based on interview with host country DNA, this contradicts with the affirmative written statement TBEC has provided that the PoA will only include self-implemented CPAs. It is to be noted that this statement was taken in serious consideration for the process of host country approval.</li> <li>Further, based on the assessment of the validation team, it is deemed that the general operating and implementing framework of the PoA has not been sufficiently described in Section A.2 of the published PoA-DD e.g. roles and functions and interrelations of the CME, CPA implementer, project owner, end users and any other PPs or third parties directly involved in the operation or implementation of the PoA and CPAs have not been sufficiently explained.</li> <li>As well, Section A.2 of PoA-DD describes steps to identify a suitable CPA that fulfils eligibility criteria for inclusion. However, it is not required to be included in this section as per the PoA-DD template.</li> <li>Similarly, scenarios of different project activities and baselines are repeated in this section A.2 which is not required.</li> </ul>		
A.2.2. Has the section A.2 of the PoA-DD described the policy/measure or stated goal that the PoA seeks to promote in a transparent and sufficient manner?	EB 55 Annex 38, §6 (c)	As per Section A.2 of the published PoA-DD, the stated goal of the PoA is to reduce GHG emissions from industrial wastewater treatment and promote the consumption of renewable energy by using biogas generated from wastewater treatment systems as fuel throughout South-East Asia. This has been described in a transparent and sufficient manner. The description has reflected the	OK	OK

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[illegible]

# Validation Report

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
<i>Country, Telephone and Fax or e-mail.</i>				
<p>A.3.3. Has the participation of each PP been approved by at least one party involved, either in a letter of approval or in a separate letter?</p> <p><i>Indicate whether a letter of approval has been received, with a clear reference to the supporting documentation. Indicate whether this letter was provided to the validation team by the project participants or directly by the DNA. Letters of approval shall be issued in accordance with the guidance provided by the CDM Executive Board (EB16, Annex 6)</i></p>	EB 55 Annex 38, §9; EB 65 Annex 4 §38	The letter of approval is pending. CAR is raised.	<del>PoA-CAR-5</del>	OK
A.3.4. Are the approvals issued from organisations listed as DNAs on the UNFCCC CDM website?	EB 55 Annex 1 §47	Pending. This will be assessed upon submission of LoA.	<del>PoA-CAR-5</del>	OK
<p>A.3.5. Does each of the written approvals confirm the following information:</p> <p>(1) that the corresponding party is a Party to the Kyoto Protocol;</p> <p>(2) that the participation is voluntary;</p> <p>(3) that the project contributes to the sustainable development in the country (only for host country approval(s));</p> <p>(4) that the project participant's information is exactly the same as in the PoA-DD;</p> <p>(5) that the PoA title referred in the approvals is consistent with the one in the POA-DD submitted for registration, or is there an additional specification of the PoA, e.g. POADD version number;</p> <p>(6) that the CME is authorized for its coordination and implementation of the PoA from each Host Party (only</p>	EB 55 Annex 1 §45 (a-d), 46, EB 55 Annex 38 §10	Pending. This will be assessed upon submission of LoA.	<del>PoA-CAR-5</del>	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
<p>for host country approval(s)); (7) that the approvals are unconditional w.r.t. the above points? <i>CME's coordination of the PoA can be authorized in the letters of approval from each Host Party or in a separate confirmation letter from each Host Party.</i></p>				
A.3.6. Is it clearly stated in section A.3 of the PoA-DD that the coordinating or managing entity of the PoA is the entity which communicates with the Executive Board (EB)?	EB 55 Annex 38, §11	Yes, it is clearly stated in Section A.3 of the published PoA-DD that TBEC, the CME of the PoA, is the entity which communicates with the EB. However, submission of Modalities of Communication (MoC) is pending.	PoA-CAR-6	OK
<p>A.3.7. As per the UNFCCC secretariat/CDM Team's request, has following points been fulfilled by the MoC before submitting request for registration:</p> <p>(1) Title of the project and names of project participants and focal points should be fully consistent with those indicated in all other project documentation submitted at the request for registration stage (e.g., PDD, LOAs, etc.);</p> <p>(2) Coordinating/managing entity of the PoA is either sole or joint focal point for each area of communication with the Board, and the limit of joint focal points for the programme shall be 5, or equal to the number of host Parties if greater than 5;</p> <p>(3) No modifications to the template/form (e.g., modifying or deleting sections of the form) should be made;</p> <p>(4) Each document (MOC statement including the Annex 1) should be clearly dated;</p> <p>(5) Focal point scopes should be clearly and correctly</p>	EB 55 Annex 38, §11 UNFCCC secretariat/CDM Team's request	The Modalities of Communication is pending. This section will be assessed upon its submission to the DOE.	PoA-CAR-6	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
<p>indicated (e.g., one focal point entity cannot be designated with 'sole' authority while another focal point entity is designated with 'joint' authority for the same scope);</p> <p>(6) Contact details and specimen signatures of focal point entities including those of project participants in Annex 1 should be correctly entered:</p> <p>(7) only one telephone, fax, e-mail contact should be entered per authorized signatory. In cases where additional contact details are included, only the first indicated information will be taken into account and only the official business address of the proposed entity should be provided on the F-CDM-MOC form;</p> <p>(8) the Statement of Agreement in Section 3 should be signed by one authorized signatory for each project participant;</p> <p>(9) signatures made available in Section 3 should correspond to those indicated in the related Annex 1 document;</p> <p>(10) focal point entities who are not designated as project participants should not sign Section 3.</p>				
A.3.8. Is there any Party/Country directly involved as project participant, and if yes, is that Party's contact details included in annex 1 of the PoA-DD and is the information provided internally consistent with section A.3 of the PoA-DD?	EB 55 Annex 1, § 52	As per section A.3 of the PoA-DD, Thailand is the only country listed, but it is stated as not directly involved as project participant, there is also no other Party/Country identified as directly involved in the PoA as PP. The information has been confirmed by the validation team during onsite interview as well.	OK	OK
<b>A.4. Technical description of the PROGRAMME of ACTIVITY (PoA)</b>				
<b>A.4.1. Location of the PoA</b>				

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
A.4.1.1. Have all host countries been correctly listed in section A.4.1.1 of the PoA-DD?	EB 55 Annex 1, § 52	The host country listed in Section A.4.1.1 of the published PoA-DD is Thailand. However, it is noted that additional countries will be added via post-registration amendments to the PoA as per EB 60 Annex 2, which is also consistent with provision in EB 65 Annex 4.	OK	OK
A.4.1.2. Does the information on the location of the PoA allow for a clear identification of the boundary for the PoA in terms of the geographical area, within which all CPAs included in this PoA will be implemented? e.g., maps in English and /or GSP Coordinates given in following formats: Latitude: 31.125833, Longitude: 30.125833	EB 55 Annex 38, §6(b)	The published PoA-DD clearly stated that at the commencement of the PoA, the physical boundary of the PoA is the national borders of Thailand. It is further noted that the PoA is intended to be applied to countries through South-East Asia, and additional countries will be added via post-registration amendments to the PoA. Detailed map (in English) has been provided for Thailand, while mentioning that additional maps will be provided in any post-registration amendments to the boundary. Nonetheless, Section A.4.1 of the published PoA-DD also included a map and description of South East Asia region. However, as per EB65 Annex 4 (§192 and 291), the PoA boundary shall only include the area where the host country LoA can be obtained during this stage, then can be extended post-registration upon receipt of other host country LoAs. Hence, if only Thailand LoA can be obtained during PoA validation process, boundary shall be only limited to Thailand, but can state that the PoA boundary may be extended post-registration. Accordingly, map Figure A.4.1 is required to be revised.	PoA-CAR-7	OK
A.4.1.3. Have all applicable national and/or sectoral policies and regulations of each host country within the boundary been considered and/or substantiated?	EB 55 Annex 38 §6(b)	In Section A.4.1.2 of the published PoA-DD, confirmation that all applicable national and/or sectoral policies and regulations of each host country within that chosen boundary have been taken into account in the baseline determination is missing. Please refer to PoA-CAR 2.	PoA-CAR-2	OK
A.4.2. Description of a typical programme activity (CPA):				
A.4.2.1. Technology or measures to be employed by the CPA				

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
A.4.2.1.1. Has it been stated in a clear, accurate and complete manner which technology or measures are to be employed by a typical CPA? Has it included a description of how environmentally safe and sound technology(ies) applied in the project activity and know-how to be used are transferred to the hostParty(ies)?	EB 55 Annex 38 § 6 (f), EB 55 Annex 1 § 58	<p>In Section A.4.2.1 of the published PoA-DD, it is stated CPA of this PoA may include one or more of the following technology measures:</p> <ul style="list-style-type: none"> <li>• Installation of an anaerobic digester with methane recovery for treatment of wastewater or sludge;</li> <li>• Installation of a facility for a treatment of sludge under clearly aerobic conditions (e.g. dewatering and land application).</li> </ul> <p>Moreover, a CPA which involves methane recovery may include one or more of the following technology measures to combust methane:</p> <ul style="list-style-type: none"> <li>• Destruction of recovered methane in a burner to produce useful heat energy</li> <li>• Destruction of recovered methane in power generation equipment to produce renewable electricity;</li> <li>• Destruction of recovered methane in a flare.</li> </ul> <p>However, the description of technology has only been provided for the case of new anaerobic digester system for wastewater and the possible usage of its biogas recovered. CAR is raised as to request further information, stated unambiguously, on other possible technologies that can be employed in this PoA. Further, in the case the CPAs may involve alteration of the existing installation or process, a clear description regarding the differences between the CPA and the pre-project situation is also required to be provided.</p> <p>The description of a typical CPA in the published PoA-DD does not include the information on whether the applied technology in the project activity is environmentally safe and sound. Furthermore, the information on technology transfer is also not included in section A.2 of the PDD.</p>	<p>PoA-CAR-8</p> <p>PoA-CAR-9</p>	<p>OK</p> <p>OK</p>

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
A.4.2.1.2. Is this description in accordance with the real situation or, in case of Greenfield CPAs, is it most likely that the CPA will be implemented acc. to the description?	EB 55 Annex 1, §§63, 64	Through physical site inspection, interview, and document review (minutes of board meeting, project design drawings etc), it was identified that the first real case CPA plans to install an anaerobic digester with biogas recovery for treatment of Palm Oil Mill Effluent (POME), whereby the existing system involves 7 open lagoons. The recovered biogas is also planned to be utilised in a power generation equipment to produce renewable electricity for exporting to Thai national grid, which is dominated by fossil fuel based power plants. It is further noted that, currently and historically, the palm oil mill where the first specific CPA is located utilises only electricity imported from the grid and no captive power plant has been identified. It is assessed that the description of a typical CPA provided in Section A.4.2 of the published PoA-DD is largely consistent with the real situation. However, the findings raised in A.4.2.1 above shall be addressed before conclusion on this issue can be done.	<del>PoA-CAR 8</del> <del>PoA-CAR 9</del>	OK OK
A.4.2.1.3. In case the CPA involves alteration of the existing installation or process, is a clear description available regarding the differences between the proposed CPA and the pre-project situation?	EB 55 Annex 1, §§63, 64	Please refer to PoA-CAR 8	<del>PoA-CAR 8</del>	OK
<b>A.4.2.2. Eligibility Criteria for inclusion of a CPA in the PoA:</b>				
A.4.2.2.1. The geographical boundary of the CPA including any time-induced boundary shall be consistent with the geographical boundary set in the PoA. Is this criteria included in the list of eligibility criteria?	EB 63 Annex 3 § 13(a) EB 65 Annex 3 § 14(a)	The published PoA-DD has an eligibility criterion stating that the CPA is located in the physical geographical boundary described in this PoA-DD.	OK	OK
A.4.2.2.2. Have Conditions that to avoid double -counting of emission reductions like unique identifications of product and end-user locations (, e.g. programme logo), and to avoid double-counting, e.g. to avoid	EB 63 Annex 3 § 13(b) EB 65 Annex 3 § 14(b)	The condition to avoid double counting of GHGs has been included as an eligibility criterion shown in the published PoA-DD. However, description regarding this eligibility criterion is not precise and it is not clear how the same can be confirmed through either (1)	<del>PoA-CAR 10</del>	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
the case of including a new CPA that has been already registered either as CDM project activity or as a CPA of another PoA, as well as internal double counting within all CPAs of this PoA been described in the eligibility criteria for inclusion of a CPA under the PoA?		UNFCCC or other GHG databases, and (2) contractual agreement relating to carbon credit. Moreover, the description regarding reference/supporting document for assessing this eligibility criterion in Section A.4.2.2 is not fully consistent with that provided in Section A.4.4.1 of the published PoA-DD. As well, it is not clear under what specific condition it is suitable for the CME to enter into contractual arrangements with the owner of the CPA facility, as suggested in the published PoA-DD, to demonstrate compliance with this eligibility criterion. Consolidated PoA-CAR is raised regarding the deficiencies of the eligibility criteria defined in the published PoA-DD for inclusion of a CPA under the PoA.		
A.4.2.2.3. Have specifications of technology/measure incl. level and type of service, performance specifications including compliance with testing/certifications been included in the eligibility criteria for inclusion of a CPA under the PoA?	EB 63 Annex 3 § 13(c) EB 65 Annex 3 § 14(c)	As per EB 63 Annex 3, the eligibility criteria for inclusion of the CPA shall include the specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications. Please refer to PoA-CAR 10.	PoA-CAR 10	OK
A.4.2.2.4. Have conditions to check the CPA start date through documentary evidence been described in the eligibility criteria for inclusion of a CPA under the PoA?  <i>CPA start date not before PoA webhosting date</i>	EB 63 Annex 3 § 13(d) EB 55 Annex 38 §7(d)	In Section A.4.2.2 of the published PoA-DD, condition to check the CPA start date through documentary evidence has not been described in the eligibility criteria for inclusion of a CPA under the PoA. Please refer to PoA-CAR 10.	PoA-CAR 10	OK
A.4.2.2.5. Have conditions that ensure compliance with applicability and other requirements of single or multiple methodology/ies and tools applied by CPAs been described in the eligibility criteria for inclusion of a CPA under the PoA?	EB 63 Annex 3 § 13(e) EB 65 Annex 3 § 14(e) and	In Section A.4.2.2 of the published PoA-DD, condition to ensure compliance with applicability conditions and other requirements of methodology and tools applied by CPAs have not been described in the eligibility criteria for inclusion of a CPA under the PoA. Please refer to PoA-CAR 10.	PoA-CAR 10	OK

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	EB 55 Annex 1 §167			
<p>A.4.2.2.6. Have conditions that ensure that CPAs meet the requirements pertaining to the demonstration of additionality been included in the eligibility criteria for inclusion of a CPA under the PoA?</p> <p><i>Please refer to "Standard for demonstration of additionality of a PoA"</i></p>	<p>EB 63 Annex 3 § 13(f)</p> <p>EB 65 Annex 3 § 14(f)</p>	<p>The eligibility criteria for CPA inclusion in the published PoA-DD included conditions to ensure that CPAs meet the requirements pertaining to the demonstration of additionality. However, as per EB65 Annex 3, PoAs that consist of one or more large scale projects as CPAs shall include the eligibility criteria derived from all the relevant requirements contained in the additionality section of the large scale methodology. The validation team has assessed that the requirements embedded in the latest version of the additionality tool has not been fully taken into account in the published PoA-DD. Please refer to PoA-CAR 10.</p>	PoA-CAR 10	OK
<p>A.4.2.2.7. Have Local stakeholder consultation prior to inclusion of the CPA been included in the eligibility criteria for inclusion of a CPA under the PoA?</p>	<p>EB 63 Annex 3 § 13(g)</p> <p>EB 65 Annex 3 § 14(g)</p>	<p>In Section A.4.2.2 of the published PoA-DD, local stakeholder consultation prior to inclusion of the CPA has not been included in the eligibility criteria for inclusion of a CPA under the PoA. CAR is raised. Please refer to PoA-CAR 10.</p>	PoA-CAR 10	OK
<p>A.4.2.2.8. Have Environmental analysis requirement of the CPA been included in the eligibility criteria for inclusion of a CPA under the PoA?</p>	<p>EB 63 Annex 3 § 13(g)</p> <p>EB 65 Annex 3 § 14(g)</p>	<p>In Section A.4.2.2 of the published PoA-DD, environmental analysis requirement of the CPA has not been included in the eligibility criteria for inclusion of a CPA under the PoA. Please refer to PoA-CAR 10.</p>	PoA-CAR 10	OK
<p>A.4.2.2.9. If applicable, has a target group (e.g. domestic/commercial/ industrial, rural/urban, grid-connected/ off-grid) and distribution mechanisms (e.g. direct installation) been defined in the eligibility criteria?</p>	<p>EB 63 Annex 3 § 13(h)</p> <p>EB 65 Annex 3 § 14(i)</p>	<p>In Section A.4.2.2 of the published PoA-DD, a target group and distribution mechanisms have not been identified in the eligibility criteria for inclusion of a CPA under the PoA. It is not clear why this is not considered as applicable. Please refer to PoA-CAR 10.</p>	PoA-CAR 10	OK
<p>A.4.2.2.10. If applicable, have the conditions related to sampling requirements for a PoA in accordance with the approved guidelines /standard from the</p>	<p>EB 63 Annex 3 § 13(j)</p> <p>EB 65 Annex 3</p>	<p>The published PoA-DD stated that all project activities in each CPA will be verified, and therefore, the sampling method/procedure will not be used for verification of the amount of reductions of</p>	N/A	N/A

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Board pertaining to sampling and surveys been included in the eligibility criteria for inclusion of a CPA under the PoA?	§ 14(j) EB65 Annex 2	anthropogenic emission by sources of GHGs achieved by CPAs under this PoA. The validation team has assessed this as reasonable and that the exclusion of this as condition in the eligibility criteria can be deemed as appropriate.		
A.4.2.2.11. If applicable, have the conditions that ensure that CPA in aggregate meets the small-scale or micro-scale threshold criteria and remain within those thresholds throughout the crediting period of the CPA?	EB 63 Annex 3 § 13(j) EB 65 Annex 3 § 14(k)	Not applicable. As per the published PoA-DD, large-scale methodology, ACM0014, will be applied to each CPA included in the PoA.	N/A	N/A
A.4.2.2.12. If applicable, have De-bundling criterion for the CPA been included in the eligibility criteria for inclusion of a CPA under the PoA?	EB 63 Annex 3 § 13(k) EB 65 Annex 3 § 14(l)	As the project applies approved large scale methodology, de-bundling is not applicable.	N/A	N/A
A.4.2.2.13. Have Public funding requirement of the CPA (e.g. conditions to provide affirmation that funding from Annex 1 parties does not result in a diversion of ODA) been included in the eligibility criteria for inclusion of a CPA under the PoA?	EB 63 Annex 3 § 13(l) EB 65 Annex 3 § 14(h)	In Section A.4.2.2 of the published PoA-DD, public funding requirement of the CPA has not been included in the eligibility criteria for inclusion of a CPA under the PoA. Please refer to PoA-CAR 10.	PoA-CAR 10	OK
A.4.2.2.14. Have provisions to ensure that those operating the CPA are aware and have agreed that their activity is being subscribed to the PoA been included in the eligibility criteria for inclusion of a CPA under the PoA?	EB 55 Annex 38 §6(i)	This condition has been included in the eligibility criteria for CPA inclusion in the published PoA-DD. However, inconsistency has been detected in the description of this eligibility criterion with its reference and supporting documents. Please refer to PoA-CAR 10.	PoA-CAR 10	OK
A.4.2.2.15. Have the provisions to ensure that the CPA crediting period not exceed the PoA end date been included in the eligibility criteria for inclusion of a CPA under the PoA?	EB 55 Annex 38, §7(c)	In Section A.4.2.2 of the published PoA-DD, provisions to ensure that the CPA crediting period not exceed the PoA end date has not been included in the eligibility criteria for inclusion of a CPA under the PoA. Please refer to PoA-CAR 10.	PoA-CAR 10	OK
A.4.2.2.16. Has it been included that the CPA shall be	EB 63 Annex 3	Although it is stated elsewhere in the published PoA-DD that TBEC	PoA-CAR 10	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
approved by the coordinating entity in the eligibility criteria for inclusion of a CPA under the PoA?	§ 9 EB 65 Annex 3 § 17	will ensure that each CPA identified for inclusion in this PoA meets the necessary requirements outlined in the PoA-DD, the condition that the CPA shall be approved by the coordinating entity has not been explicitly included in the eligibility criteria. Please refer to PoA-CAR 10.		
A.4.2.2.17. Are the eligibility criteria specified in the PoA-DD sufficiently objective and comprehensive to ensure that all CPAs would comply with the CDM requirements applicable to the PoA?  <i>If more requirements are necessary to be included in the eligibility criteria but not covered by the abovementioned questions, please describe.</i>	EB 55 Annex 1 § 167 EB63 Annex 3 §8	In addition, regarding eligibility criterion to ensure that the CPA implementer is undertaking a voluntary action and is not implementing a mandatory policy/regulation, unless both entities are same, it is not sufficient to simply rely on the CPA implementer to state that it is a voluntary initiative; the same must be cross-checked by the CME. Please refer to PoA-CAR 10.	PoA-CAR 10	OK
A.4.2.2.18. Are all listed eligibility criteria verifiable?	EB 63 Annex 3 § 7	Further, reference/supporting documents cited as proofs for demonstrating compliance to the eligibility criteria are said to be under preparation and were not shown to the validation team during the site visit assessment. Hence, the PP is required to demonstrate how all the eligibility criteria can be verifiable. Please refer to PoA-CAR 10.  All the issues raised in PoA-CAR 10 need to be closed out.	PoA-CAR 10	OK
<b>A.4.3. Assessment and Demonstration of Additionality:</b>				
A.4.3.1. Has it formally been stated that the proposed PoA is a voluntary coordinated action in section A.4.3 of the PoA-DD?	EB 55 Annex 38 § 4	It has been formally stated in Section A.4.3 of the published PoA-DD that the implementation of the PoA is a voluntary action by TBEC and is not required by any mandatory policy or regulation of the government. However, it is deemed that description on the legal obligations of implementing technologies is incomplete, considering that the same has only been described for anaerobic digester system at facilities where wastewater is treated in anaerobic open lagoons, which does not cover the full scope of the PoA. CL is raised.	PoA-CL 1	OK

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# Validation Report

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
A.4.4.1. Operation and management plan				
A.4.4.1.1. Has the CME clearly established operational and management arrangements for the implementation of the PoA?	EB 55 Annex 38 § 6(i) EB65 Annex 3 § 17	Yes, the TBEC has established operational and management arrangements for the implementation of the PoA.	OK	OK
A.4.4.1.2. Are the arrangements sufficient to ensure that that there is a sound record keeping system for each CPA under the PoA, and the CME will have control of all records and information related to the implementation of individual CPAs and will be in a position to ensure each CPA is being operated in accordance with the specific requirements of the programme?	EB 55 Annex 1 § 166 EB63 Annex 3 9(e) EB 65 Annex 3 § 17(e)	Based on Section A.4.4.1 of the published PoA-DD, TBEC will maintain an electronic database of information on each CPA. Based on the provided description, it seems that the record keeping system will only contain the identification information of each CPA as well as keeping PDF electronic copies of CPA-DD documents as completed by the CPA implementers. However, it is not clear how the operational and management plan will be sufficient in ensuring that the CME will have control of all records and information related to the implementation of individual CPAs and will be in a position to ensure each CPA is being operated in accordance with specific requirements of the PoA. Consolidated CL is raised regarding the deficiencies in the operation and management arrangements for the implementation of the PoA:	PoA-CL-2	OK
A.4.4.1.3. Has a clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies made available to the DOE at time of validation of the PoA?	EB 63 Annex 3 § 9(a) EB 65 Annex 3 § 17(a)	A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies has not been made available to the DOE. Please refer to PoA-CL 2.	PoA-CL-2	OK
A.4.4.1.4. Have records of arrangements for training and capacity development for personnel made available to the DOE at time of validation?	EB 63 Annex 3 § 9(b) EB 65 Annex 3 § 17(b)	Records of arrangements for training and capacity development for personnel have not been made available to the DOE. Please refer to PoA-CL 2	PoA-CL-2	OK
A.4.4.1.5. Have procedures for technical review of inclusion of CPAs made available to the DOE at time of	EB 63 Annex 3 § 9(c)	Procedures for technical review of inclusion of CPAs have not been made available to the DOE.	PoA-CL 2	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
validation of PoA	EB 65 Annex 3 § 17(c)	Please refer to PoA-CL 2.		
A.4.4.1.6. Have procedures to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another PoA) made available to DOE at time of validation of PoA?	EB 63 Annex 3 § 9(d) EB 65 Annex 3 § 17(d)	As per Section 4.4.1 of the published PoA-DD, the procedures to avoid double counting are available. However, please refer to PoA-CAR 10.	PoA-CAR 10	OK
A.4.4.1.7. Have measures for continual improvement of PoA management system made available to DOE at time of validation of PoA?	EB 63 Annex 3 § 9(f) EB 65 Annex 3 § 17(f)	Measures for continual improvement of PoA management system have not been made available to DOE. Please refer to PoA-CL 2.	PoA-CL 2	OK
A.4.4.1.8. Are there proofs and/or agreements that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA?	EB 55 Annex 38 § 6(i)	Proofs and/or agreements that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA have not been made available to the DOE. Please refer to PoA-CL 2.	PoA-CL 2	OK
A.4.4.1.9. Are procedures identified for data management (incl. data collection, data transfer and data archive until 2 years after the end of crediting period of each CPA, etc.)?	EB 55 Annex 1 123 (b)	Further clarification along with substantiating evidence is requested regarding procedures identified for data management (including data collection, data transfer and data archive). Please refer to PoA-CL 2.	PoA-CL 2	OK
<b>A.4.4.2. PoA monitoring plan</b>				
A.4.4.2.1. If the CME does not wish to have all CPAs verified, has a description of the proposed statistically sound sampling method/procedure to be used by DOEs for verification of the CPA GHG emission reductions been provided?  <i>Please refer to latest EB guidance on sampling. The request for issuance of a PoA shall relate to all CPAs included in the PoA during the specified monitoring period. The monitoring periods shall be consecutive. A request for</i>	EB 55 Annex 38, §6(k) and §37	Not applicable. As per Section 4.4.2 of the published PoA-DD, all CPAs will be verified.	N/A	N/A

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
<i>issuance shall relate to the certified emission reductions verified as per above. (EB55 Annex 38 §37)</i>				
A.4.4.2.2. Does the monitoring plan for the PoA avoid internal double accounting of emission reduction calculations in case the CME would opt for a verification method that does not use sampling but verifies each CPA; and that the status of verification for each CPA can be determined any time?	EB 33 Annex 43	An explanation to avoid double counting has been described in Section A.4.4.2 of the published PoA-DD. However, please refer to PoA-CAR 10. The PoA-DD should be updated as necessary.	PoA-CAR 10	OK
<b>A.4.5. Public Funding of the PoA</b>				
A.4.5.1. Is there any public funding used for implementation of this PoA?		It is stated in Section A.4.5 of the published PoA-DD that no public funding from Annex 1 parties will be used for the PoA. Nonetheless, confirmation on the same shall be stated in Annex 2 of the PoA-DD. CAR is raised.	PoA-CAR 12	OK
A.4.5.2. If public funding is granted was a written confirmation from the relevant Annex I country DNA provided with the content that such funding does not result in a diversion of official development assistance (ODA)?	EB 55 Annex 38, §6(n))	Pending closure of PoA-CAR 12	PoA-CAR 12	OK
A.4.5.3. Is any further information provided in PoA-DD annex 2 on public funding used for the PoA? If any, is this consistent with the actual situation presented by the project participants?		Pending closure of PoA-CAR 12	PoA-CAR 12	OK
A.4.5.4. Has it been confirmed whether there are any bilateral or multilateral fund project participants involved in the PoA, and if yes, the following information shall be provided to the DOE: • Full official name of the entity fund;	EB 55 Annex 1, § 100 (b) Glossary of CDM terms	Through onsite interview, it was confirmed that there is no bilateral or multilateral fund PP involved in the PoA. This is also consistent with Section A.3 and Annex 1 of the published PoA-DD that TBEC is the only PP in the PoA.	OK	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
<ul style="list-style-type: none"> <li>• Name of company managing the fund;</li> <li>• Party(ies) authorizing participation of the Fund;</li> <li>• DNA approval of voluntary participation in the PoA and confirmation that it has ratified the Kyoto Protocol;</li> <li>• DNA authorization of the fund to the project participant (can be combined with the approval document)</li> </ul> <p><i>Multilateral funds do not necessarily require written approval from each participant's DNA. However those not providing a written approval may be giving up some of their rights and privileges in terms of being a Party involved in the project. (Glossary of CDM terms (version 5))</i></p>				
<b>B. Duration of the programme of activities</b>				
<b>B.1. Starting date of the programme of activities</b>				
B.1.1. Has the start date of the PoA been indicated using the dd/mm/yyyy?		The starting date of the PoA has been indicated in Section B.1 of the published PoA-DD as 31/12/11. However, it should be specified in the format of dd/mm/yyyy. Moreover, in case of large-scale PoA, the start date must be stated as at least 8 weeks after the estimated submission (request for registration) date. CAR is raised.	PoA-CAR 13	OK
B.1.2. Is this start date reasonably defined?  <i>The crediting period of the PoA should be renewed every seven years (every 20 years for A/R PoA) from the start date of the lifetime of the PoA. Life time of the PoA starts on the date specified in the PoADD section B.1 or on the date of registration, whichever is later. In case of small-scale PoA, the start date must be stated as at least 4 weeks after the estimated submission date; In case of large-scale PoA, the start date must be stated as at least 8 weeks after the estimated submission date.</i>	PoA request registration uploading step 4 requirement	Please also refer to PoA-CAR 13.	PoA-CAR 13	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
<b>B.2. Length of the programme of activities</b>				
B.2.1. Is the indicated duration of the PoA by the coordinating and managing entity ? <i>PoA duration should not exceeding 28 years (60 years for A/R)</i>	EB 55 Annex 38, §6(h) and 7(d))	As per Section B.2 of the published PoA-DD, the length of the PoA is 28 years.	OK	OK
<b>C. Environmental impact Analysis (eia)</b>				
<b>C.1. Definition of the level EIA as per requirements of the CDM modalities and procedures</b>				
C.1.1. Has the level of environmental analysis been defined (at PoA or CPA level)?	EB 55 Annex 38 § 6(l)	As per Section C.1 of the published PoA-DD, environmental analysis will be performed at CPA level.	OK	OK
C.1.2. Has any justification been provided for the choice of the level of environmental analysis?	EB 55 Annex 38 § 6(l)	As per Section C.1 of the published PoA-DD, the choice of environmental analysis has been justified on ground that individual CPAs will vary in their design and such choice will thus enable the specific local impacts be analysed. This has been assessed by the validation team as reasonable and can be accepted.	OK	OK
<b>C.2. Documentation on the EIA including transboundary impacts</b>				
C.2.1. Has any documentation on environmental analysis of the PoA as per requirements of the CDM modalities and procedures been described in the PoA-DD?	EB 55 Annex 38, §6(l)	Not applicable. The documentation on environmental analysis has been conducted at CPA level as indicated in Section C.2 of the published PoA-DD.	N/A	OK
C.2.2. Were transboundary environmental impacts identified in the environmental analysis and addressed?	EB 55 Annex 1, §§ 131 – 133	Not Applicable. The documentation on environmental analysis has been conducted at CPA level as indicated in Section C.2 of the published PoA-DD.	N/A	OK
<b>C.3. EIA required by Host Country</b>				
C.3.1. If an EIA is necessary for a typical CPA according to the host country laws, has it been indicated in section C.3 of the PoA-DD?	EB 55 Annex 1, § 136 (d)	Information regarding the requirement of EIA for a typical CPA included in the PoA is missing in Section C.3 of the published PoA-DD. CAR is raised.	<del>PoA-CAR-14</del>	OK
<b>D. LOCAL STAKEHOLDERS' CONSULTATION AND COMMENTS</b>				
<b>D.1. Level of Local Stakeholder Consultation</b>				
D.1.1. Is it indicated whether the Local Stakeholder	EB 55 Annex 1,	It is stated in Section D.1 of the published PoA that: "Stakeholder	<del>PoA-CAR-15</del>	OK

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Comments will be invited at PoA or CPA level?	§§ 127– 129)	comments will be invited at both PoA- and CPA-level. Local stakeholders will be invited at the CPA level". The inconsistency in these two sentences requires correction. It is also not appropriate to perform stakeholder consultation at both levels. Moreover, justification on the choice of the level of local stakeholder comments being invited has not been provided in Section D.1 as required by PoA-DD template. PoA-DD to be revised as appropriate. CAR is raised.		
D.1.2. Has any justification been provided for the choice of the level of Local Stakeholder Comments being invited?	EB 55 Annex 38 § 6(m))	Please refer to PoA-CAR 15.	<del>PoA-CAR 15</del>	OK
<b>D.2. Description how comments have been invited</b>				
D.2.1. If the stakeholder comments will be invited at PoA level, has it been indicated how local stakeholders' comments were invited prior to the publication of the PoA-DD?	EB 55 Annex 38, §6(m); EB 55 Annex 1, §§128– 130)	Please refer to PoA-CAR 15.	<del>PoA-CAR 15</del>	OK
D.2.2. If the stakeholder comments will be invited at PoA level, can the local stakeholder consultation process be deemed as adequate?	EB 55 Annex 1, §130)	Please refer to PoA-CAR 15	<del>PoA-CAR 15</del>	OK
<b>D.3. Summary of comments</b>				
D.3.1. If the stakeholder comments will be invited at PoA level, has any summary of the contents been sufficiently provided?	EB 55 Annex 1, §§ 128– 130)	Please refer to PoA-CAR 15	<del>PoA-CAR 15</del>	OK
<b>D.4. Report on how due account was taken of any comments received</b>				
D.4.1. If the stakeholder comments will be invited at PoA level, has it been indicated how due account was taken of any comments received?	EB 55 Annex 1, §§ 128– 130)	Please refer to PoA-CAR 15	<del>PoA-CAR 15</del>	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
E. Application of a baseline and monitoring methodology to a typical CPA				
E.1. Title and reference of the approved Baseline and Monitoring Methodology applied to CPA included in the PoA				
E.1.1. Does the PoA-DD correctly quote the methodology(ies)? Is a valid version of the methodology(ies) applied? Has a reference been indicated in the PoA-DD?	EB 55 Annex 1 § 70, 71	Section E.1 of the published PoA stated that ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" (version 04.1.0, EB58) will be applied to each CPA included in the PoA. This validation team has assessed this as being correctly quoted as well as being the valid version of the methodology.	OK	OK
E.1.2. Has the methodology or the combination of multiple methodologies applied been approved by the EB for use of a PoA?	EB 47 Annex 31 EB 61 Annex 21 § 11a)	The applied methodology has been approved by the EB and can be used for the PoA.	OK	OK
E.1.3. Does the PoA-DD correctly quote the tools/guidelines referred in the methodology(ies)? Is the list of tools/guidelines complete? Are the valid versions of the tool(s) /guidelines applied? Has a reference been indicated in the PoA-DD?	EB 55 Annex 1 § 68	All the tools/guidelines referred to in the applied methodology shall be clarified, including their version numbers. Latest version of the tools has also not been consistently referenced throughout the PoA-DD. CAR is raised.	PoA-CAR-16	OK
E.2. Justification of the choice of the Methodology and why it is applicable to a CPA				
Please list all Applicability Criteria of the approved methodology or any other tool or other methodology component referred to therein.				
Applicability of ACM0014 Version 04.1.0				
E.2.1. Have all applicability criteria in the applied methodology(ies) been sufficiently justified for a typical CPA? Have the justifications refer to corresponding eligibility criteria for inclusion of a CPA under the PoA?  <i>Describe for each applicability criterion listed in the selected approved methodology the steps taken to assess the information contained in the POA-DD.</i>	EB 55 Annex 1, §§66 (a), 66 (b), 68, 70, 75	Applicability of ACM0014 <u>Criteria 1</u> <i>This methodology is applicable to project activities that aim at reducing methane emissions from industrial wastewater treatment. The methodology is applicable to the scenarios described in Table 1 therein, as summarised as follows:</i> <u>Scenario 1</u> <ul style="list-style-type: none"> <li><i>Description of the baseline scenario: the wastewater is not treated, but directed to open lagoons that have clearly</i></li> </ul>		

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		<p><i>anaerobic conditions. In cases where solid materials are separated before directing the wastewater to the open lagoons, the solid materials have a different treatment than the wastewater.</i></p> <ul style="list-style-type: none"> <li><i><u>Description of the project activity:</u> the wastewater is either treated in a new anaerobic digester or dewatered and directed to land application. In cases where solid materials are separated from the wastewater (both in the project and baseline scenarios), they will be treated separately and not treated with the new anaerobic digester employed for treatment of liquid effluents. The biogas extracted from the anaerobic digester and, if applicable, biogas generated from the treatment of solid materials, is flared and/or used to generate electricity and/or heat. The residual from the anaerobic digester, after treatment, is directed to open lagoons or is treated under clearly aerobic conditions (e.g. dewatering and land application)</i></li> </ul> <p><i>Scenario 2</i></p> <ul style="list-style-type: none"> <li><i>The wastewater is treated in a wastewater treatment plant. Sludge is generated from primary and/or secondary settlers. The sludge is directed to sludge pit(s) that have clearly anaerobic conditions</i></li> <li><i>The wastewater is treated in the same wastewater treatment plant as in the baseline situation. The sludge from primary and/or secondary settler is treated in one or both of the following ways: (a) the sludge is treated in a new anaerobic digester. The biogas extracted from the anaerobic digester is flared and/or used to generate electricity and/or heat. The residual from the anaerobic</i></li> </ul>		

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		<p><i>digester after treatment is directed to open lagoons or is treated under clearly aerobic conditions (e.g. dewatering and land application); and (b) the sludge is treated under clearly aerobic conditions (e.g. dewatering and land application).</i></p> <p>Assessment by the validation team: This criterion has been discussed in the published PoA-DD, where it is mentioned that a typical CPA will fall in either Scenario 1 or Scenario 2 described in Table 1 of ACM0014. However, it is not clear how the same can be confirmed as to ensure compliance to each CPA. Consolidated CL is raised regarding the applicability conditions of ACM0014.</p> <p><u>Criteria 2</u> <i>The average depth of the open lagoons or sludge pits in the baseline scenario is at least 1 meter.</i></p> <p>Assessment by the validation team: This criterion has been discussed in the published PoA-DD, where it is mentioned that a typical CPA project site will have open lagoons exceeding 1 meter (including the most likely pond design identified in Greenfield projects). The PP also mentioned that this is consistent with TBEC's existing four registered CDM projects. However, it is not clear how the same can be confirmed as to ensure compliance to each CPA. Please refer to PoA-CL 3</p> <p><u>Criteria 3</u> <i>Heat and electricity requirements per unit input of the water treatment facility remain largely unchanged in the baseline scenario and the project activity.</i></p> <p>Assessment by the validation team: This criterion has been discussed in the published PoA-DD, where it</p>	<p>PoA-CL 3</p> <p>PoA-CL 3</p>	<p>OK</p> <p>OK</p>

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		<p>is mentioned that a typical CPA will not alter existing wastewater treatment facilities but instead install a new biogas system, which as such, the heat and electricity requirements of the existing system will remain largely unchanged. First of all, this statement requires justification as such provision seems not sufficient to ensure that energy requirements remain largely unchanged in the baseline and project scenario, especially for each and every CPAs. Second, it is to be noted that the PoA is also intended to be applicable to CPAs that entails treatment of sludge under clearly aerobic conditions; hence in such case, the PP's statement concerning justification of this applicability criterion is not valid. Please refer to PoA-CL 3</p> <p><u>Criteria 4</u>  <i>Data requirements as laid out in this methodology are fulfilled.</i>                      Assessment by the validation team:                      This criterion has been discussed in the published PoA-DD, where it is mentioned that the data required by the methodology will be recorded in the CPA. However, it is not clear how the requirements will be fulfilled by each CPA. Please refer to PoA-CL 3</p> <p><u>Criteria 5</u> [Only applicable only for Scenario 1]  <i>The residence time of the organic matter in the open lagoon system should be at least 30 days.</i>                      Assessment by the validation team:                      This criterion has been discussed in the published PoA-DD, where it is mentioned that open lagoons at a typical CPA project site will exceed the 30 days residence time. However, it is not clear how the same can be confirmed as to ensure compliance to each CPA. Please refer to PoA-CL 3</p> <p><u>Criteria 6</u> [Only applicable only for Scenario 1]  <i>Local regulations do not prevent discharge of wastewater in open</i></p>	<p>PoA-CL 3</p> <p>PoA-CL 3</p> <p>PoA-CL 3</p>	<p>OK</p> <p>OK</p> <p>OK</p>

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
		<p><i>lagoons.</i></p> <p>Assessment by the validation team:</p> <p>This criterion has been discussed in the published PoA-DD, where it is mentioned that, in Thailand, Notification No. 2 of Ministry of Industry (B.E. 2539) regarding wastewater from industrial factory does not prevent discharge of wastewater into open lagoons, which is deemed as acceptable according to local expertise.</p> <p><u>Criteria 7</u> [Only applicable only for Scenario 1]</p> <p><i>Inclusion of solid materials in the project activity is only applicable where: (i) such solid materials are generated by the industrial facility producing the wastewater, and (ii) the solid materials would be generated both in the project and in the baseline scenario.</i></p> <p>Assessment by the validation team:</p> <p>This criterion has been discussed in the published PoA-DD, where it is mentioned that a typical CPA will only include solid materials if these conditions are met, which will be ensured through the design of CPA technology and operating procedure. This, in principle, is deemed as appropriate and can be accepted by the validation team. However, sample design and operating procedure as well as technical review procedure for CPA inclusion have not been submitted to the DOE during the site visit assessment for substantiating the same. Please refer to PoA-CL 3</p> <p><u>Criteria 8</u> [Only applicable only for Scenario 2]</p> <p><i>The sludge produced during the implementation of the project activity is not stored onsite before land application to avoid any possible methane emissions from anaerobic degradation.</i></p> <p>Assessment by the validation team:</p> <p>This criterion has been discussed in the published PoA-DD, where it is mentioned that a typical CPA will not store sludge onsite before</p>	<p>OK</p> <p>PoA-CL 3</p>	<p>OK</p> <p>OK</p>

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.																
		land application. However, it is not clear how the same can be confirmed as to ensure compliance to each CPA. Please refer to PoA-CL 3	<del>PoA-CL 3</del>	OK																
<p>E.2.2. Have all applicability criteria in the applied tools/guidelines referred to therein been sufficiently fulfilled by a typical CPA?</p> <p><i>Describe for each applicability criterion listed in the selected approved tool(s) the steps taken to assess the information contained in the POA-DD.</i></p>		As per Section E.2 of the published PoA-DD, applicability criteria in the applied tools and their fulfilment by a typical CPA have not been discussed. CAR is raised.	<del>PoA-CAR 17</del>	OK																
<b>E.3. DESCRIPTION OF THE SOURCES AND GASES INCLUDED IN THE CPA BOUNDARY</b>																				
E.3.1. Has the spatial boundary (physical) of a typical CPA clearly defined?	EB 55 Annex 1 § 67a, 78ff	As per Section E.3 of the published PoA-DD, spatial boundary of a typical CPA has not been defined. CAR is raised.	<del>PoA-CAR 18</del>	OK																
E.3.2. Are all sources and gases within the CPA boundary described in a clear manner in the PoA-DD in accordance with the applied methodology(ies)?	ACM0014	<p>As per the published PoA-DD the following sources, gases and their justification are included:</p> <table border="1"> <thead> <tr> <th></th><th>Source</th><th>Gas</th><th></th><th>Justification / Explanation</th></tr> </thead> <tbody> <tr> <td rowspan="3">Baseline</td><td rowspan="3">Wastewater treatment processes or sludge disposal</td><td>CH<sub>4</sub></td><td>Included</td><td>The major source of emissions in the baseline from open lagoons (Scenario 1) or disposal of sludge (Scenario 2)</td></tr> <tr> <td>N<sub>2</sub>O</td><td>Excluded</td><td>Excluded for simplification. This is conservative</td></tr> <tr> <td>CO<sub>2</sub></td><td>Excluded</td><td>CO<sub>2</sub> emissions from the decomposition of organic waste are not accounted for</td></tr> </tbody> </table>		Source	Gas		Justification / Explanation	Baseline	Wastewater treatment processes or sludge disposal	CH <sub>4</sub>	Included	The major source of emissions in the baseline from open lagoons (Scenario 1) or disposal of sludge (Scenario 2)	N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative	CO <sub>2</sub>	Excluded	CO <sub>2</sub> emissions from the decomposition of organic waste are not accounted for	OK	OK
	Source	Gas		Justification / Explanation																
Baseline	Wastewater treatment processes or sludge disposal	CH <sub>4</sub>	Included	The major source of emissions in the baseline from open lagoons (Scenario 1) or disposal of sludge (Scenario 2)																
		N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative																
		CO <sub>2</sub>	Excluded	CO <sub>2</sub> emissions from the decomposition of organic waste are not accounted for																

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION						ASSESSMENT	FINAL CON.
				Electricity consumption / generation	CO <sub>2</sub>	Included	Electricity may be consumed for the operation of the wastewater or sludge treatment system in the baseline scenario. If electricity is generated with biogas from an anaerobic digester under the project activity, electricity generation in the grid or on-site is displaced by the project activity. Further, the published PoA-DD stated that each CPA will be assessed on a case-by-case basis in the CPA-DD to determine if this is an applicable emissions source.		
					CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative		
					N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative		
				Thermal energy generation	CO <sub>2</sub>	Included	If thermal energy is generated with biogas from an anaerobic digester under the project activity, on-site thermal energy generation is displaced by the project activity. Further, the published PoA-DD stated that each CPA will be assessed on a case-by-case basis in the CPA-DD to determine if this is an applicable emissions source.		
					CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative		
					N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative		

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION				ASSESSMENT	FINAL CON.
		Project Activity	Wastewater treatment processes or sludge treatment process	CH <sub>4</sub>	Included	<p>The treatment of wastewater or sludge under the project activity may cause different emissions:</p> <ul style="list-style-type: none"> <li>(i) Methane emissions from the lagoons (if effluent from the treatment under the project activity is directed to lagoons);</li> <li>(ii) Physical leakage of methane from the digester system;</li> <li>(iii) Methane emissions from flaring (if biogas from the digester is flared);</li> <li>(iv) Methane emissions from land application of wastewater/sludge;</li> <li>(v) Methane emissions from wastewater removed in the dewatering process</li> </ul>	
				CO <sub>2</sub>	Excluded	CO <sub>2</sub> emissions from the decomposition of organic waste are not accounted for	
				N <sub>2</sub> O	Included	In case of projects that involve land application of sludge. Further, the published PoA-DD stated that each CPA will be assessed on a case-by-case basis in the CPA-DD to determine if this is an applicable emissions source.	

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION					ASSESSMENT	FINAL CON.				
			On-site electricity use	CO <sub>2</sub>	Included	May be an important emission source. If electricity is generated with biogas from an anaerobic digester, these emissions are not accounted for. Any on-site electricity consumption should be subtracted from the electricity generation of the digester. Further, the published PoA-DD stated that each CPA will be assessed on a case-by-case basis in the CPA-DD to determine if this is an applicable emissions source.						
				CH <sub>4</sub>	Excluded	Excluded for simplification. This emission source is assumed to be very small						
				N <sub>2</sub> O	Excluded	Excluded for simplification. This emission source is assumed to be very small						
			On-site fossil fuel consumption	CO <sub>2</sub>	Included	May be an important emission source. Further, the published PoA-DD stated that each CPA will be assessed on a case-by-case basis in the CPA-DD to determine if this is an applicable emissions source.						
				CH <sub>4</sub>	Excluded	Excluded for simplification. This emission source is assumed to be very small						
				N <sub>2</sub> O	Excluded	Excluded for simplification. This emission source is assumed to be very small						
		The validation team has assessed the above and can confirm that all sources and gases within the CPA boundary are described in a clear manner in the published PoA-DD in accordance with the applied methodology.										
		E.3.3. Are provisions in place for the case that a CPA implementation might lead to GHG emissions within the project boundary which may contribute more than	EB 55 Annex 1, §77	The published PoA-DD does not describe provisions the case that a CPA implementation might lead to GHG emissions within the project boundary which are expected to contribute more than 1% of the					PoA-CAR 19	OK		

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
1% of the overall expected average annual emission reductions, but are not addressed by the methodology?		overall expected average annual emission reductions, which are not addressed by the methodology. CAR is raised.		
<b>E.4. IDENTIFICATION AND DESCRIPTION of the BASELINE SCENARIO</b>				
E.4.1. Are there any procedures in the methodology to identify the most reasonable baseline scenario? Does this include a description of the technology that would be employed in the absence of the CDM project activity? (Please list them and review whether they were applied correctly)	EB 55 Annex 1 § 81, 85  ACM0014	ACM0014 prescribed procedure for the identification of the most plausible baseline scenario through the application of the following steps, which have been applied in Section E.4 of the published PoA-DD and assessed by the validation team as follows: <i>Step 1: Identification of alternative scenarios</i> <u>Alternative scenarios for the treatment of wastewater (W)</u> The published PoA-DD, seven plausible alternatives (W1-7) for the treatment of wastewater has been identified. This has been assessed as in accordance with the suggested list in the applied methodology. The published PoA-DD has also provided provisions regarding the specifications of W1 Scenario (i.e. the use of open lagoons for the treatment of wastewater), in the case of project activities being implemented in Greenfield facilities. The validation team has also reviewed such provision and can confirm that it is in accordance with the relevant requirements in ACM0014. Further, the published PoA-DD has eliminated scenario W3 (aerobic wastewater treatment facilities), as a plausible baseline scenario. Justification is required as although there are no revenues or cost savings to be gained, it may still be a plausible scenario. Moreover, this contradicts with the fact that alternative W3 is the only possible option for treatment of wastewater under Scenario 2 in Table 1 of the applied methodology, which has been described in the published PoA as a possible technological choice to be implemented in the CPA. A consolidated CL is raised regarding the approach adopted for the	PoA-CL4	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
		<p>determination of baseline scenario as demonstrated in the published PoA-DD.</p> <p>Similarly, the published PoA-DD has also eliminated scenario W4 (anaerobic digester with methane recovery and flaring) on ground that there are no revenues or cost savings. However, this contradicts with the description provided regarding technology to be employed by the CPA as well as the eligibility criteria shown in the published PoA-DD. The PoA-DD to be revised as necessary.</p> <p>Please refer to PoA-CL 4</p> <p><u>Alternative scenarios for the treatment of sludge (S)</u></p> <p>In case of baseline/project Scenario 2, six plausible alternative scenarios have been identified for treatment of sludge (S1-6) in the published PoA-DD. The validation team has assessed this to be in accordance with suggested list in the applied methodology.</p> <p><u>Alternative scenarios for the generation of electricity (E)</u></p> <p>Three plausible alternative scenarios have been identified for the generation of electricity (E1-3) in the published PoA-DD. The validation team has assessed this to be in accordance with suggested list in the applied methodology.</p> <p><u>Alternative scenarios for the generation of heat (H)</u></p> <p>Three plausible alternative scenarios have been identified for the generation of heat (H1-3) in the published PoA-DD. The validation team has assessed this to be in accordance with suggested list in the applied methodology.</p> <p><u>Alternative scenarios for the treatment of solid materials</u></p> <p>Four plausible alternative scenarios have been identified for the generation of heat (SM1-4) in the published PoA-DD. The validation team has assessed this to be in accordance with suggested list in the applied methodology.</p>	PoA-CL4	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
		<p><i>Step 2: Eliminate alternatives that are not complying with applicable laws and regulations</i></p> <p>In the published PoA-DD, it is mentioned that under Thai regulations, it is illegal to directly discharge wastewater into water bodies. However, it is not clear why this regulation has been used for the elimination of alternatives W6 (wastewater is directed to land application without dewatering and W7 (wastewater is dewatered and directed to land application/used as fuel in energy applications). Moreover, discussion regarding host country policy and incentive for water pollution control and renewable energy use is missing. Please refer to PoA-CL 4</p> <p><i>Step 3: Eliminate alternatives that face prohibitive barriers</i></p> <p>As per Section E.4 of the published PoA-DD, Step 3 of the latest version of the additionality tool has not been properly applied as per the required procedure for identification of the most plausible baseline scenario. Moreover, justification is necessary as to whether the listed barriers are valid in accordance with EB50 Annex 13. Please refer to PoA-CL 4</p> <p><i>Step 4: Compare economic attractiveness of remaining alternatives</i></p> <p>As per Section E.4 of the published PoA-DD, there is only one remaining alternatives left. Thus, economic attractiveness of remaining alternatives has not been compared. The approach is acceptable, though PoA-CL 4 needs closing out.</p>	<p>PoA-CL 4</p> <p>OK</p> <p>PoA-CL 4</p> <p>OK</p>	<p>OK</p> <p>OK</p>
E.4.2. Is the list of alternatives to a typical CPA complete? e.g., has it included the status-quo situation, the CPA not undertaken as a CDM project as well as other viable means of supplying the outputs or services that are to be supplied by the proposed CPA?	EB 55 Annex 1, §§ 67 (b), 82, §§ 104 – 106	The list of alternatives to a typical CPA includes the status quo situation, the CPA not undertaken as a CDM project as well as other viable means of supplying the outputs or services that are to be supplied by the proposed CPA. However, the exclusion of some alternatives on ground of their implausibility needs justification. Please refer to PoA-CL 4.	PoA-CL 4	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
E.4.3. Does the PoA-DD identify correctly and exclude those options not in line with host country regulatory or legal requirements?	EB55 Annex 1, §§ 85, 87(d); EB55 Annex 38, § 6(b)	Please refer to PoA-CL 4	PoA-CL 4	OK
E.4.4. What is the most likely baseline scenario in absence of the project activity as indicated in the PoA-DD?	EB 55 Annex 1, §§80-91)	As per the published PoA-DD, the most likely baseline scenario in the absence of the project activity is W1 the use of open lagoons for the treatment of wastewater. However, closure of PoA-CL 4 is pending.	PoA-CL 4	OK
E.4.5. Is additional background information on baseline data provided in PoA-DD annex 3? Is this information consistent with data presented by other sections of the PoA-DD and verifiable?	EB 33 Annex 43	The additional background information on baseline data has not been provided in PoA-DD Annex 3. Nonetheless, confirmation that this section has intentionally been left blank shall be provided. Please refer to PoA-CL 4.	PoA-CL 4	OK
E.4.6. Are the provisions for the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	EB 55 Annex 1, § 92(a)	Not yet OK. Closure of PoA-CL 4 is pending.	PoA-CL 4	OK
<b>E.5. CPA ADDITIONALITY</b>				
<b>E.5.1. Assessment and Demonstration of ADDITIONALITY for a typical CPA</b>				
E.5.1.1. If required by methodology, check whether the latest version of the additionality tool is applied and confirm whether all steps are correctly applied	EB 55 Annex 1, §96	The applied methodology requires the use of latest version of the additionality tool. Hence, the same should be consistently referenced throughout the PoA-DD. Please refer to PoA-CAR 16. Moreover, as per the published PoA-DD, the required steps in the additionality tool have not been correctly applied. Please refer to PoA-CAR 10.	PoA-CAR 16  PoA-CAR 10	OK
E.5.1.2. Does the PoA-DD include provision that a typical CPA starting date will be defined in accordance with the CDM glossary of terms and substantiated with reliable evidences?	EB 55 Annex 1, §101	Please refer to PoA-CAR 10	PoA-CAR 10	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
E.5.1.3. Is the starting date of the 1st CPA indicated in the real case CPA-DD section A.4.2.1 after the commencement of validation of the PoA, i.e., the date on which the PDDs are first published for global stakeholder consultations?  Otherwise please refer to EB 47 meeting report §72.	EB 55 Annex 38 §7(d)	As per Section A.4.2.1 of the published CPA-DD (real case), the start date of CPA is defined as 15/09/2012. This is assessed as after the commencement of validation of the PoA.	OK	OK
E.5.1.4. Is additionality demonstrated on PoA or CPA level? Describe whether the criteria and data for assessing additionality of a CPA shall be included into the PoA-DD or will be included in CPA-DD?	EB 47 §73 EB 55 Annex 1 § 95	As per Section E.5.1 of the published PoA-DD, the additionality is demonstrated on CPA level. Moreover, the criteria and data for assessing additionality of a CPA have been included in the published PoA-DD, which is acceptable.	OK	OK
E.5.1.5. Please describe how the reliability and credibility of all data, rationales, assumptions, justifications and documentation provided by the PP to support the demonstration of additionality is assessed and validated, e.g. using local knowledge, sectoral and financial expertise and considering other sources of information for cross checks	EB 55 Annex 1 § 95	As per the published PoA-DD, additionality shall be demonstrated on CPA level. However, the below consolidated CL is raised regarding the appropriateness of parameters and data sources specified in the published PoA-DD as to be used in the investment analysis at CPA level:  It is not clear what considered as similar plants/project structure, where the technology efficiency, conversion factor or historical records of which will be used as the basis for calculating (a) yearly methane production, (b) yearly electricity production, (c) percentage of biogas flared. Please refer to PoA-CL 5  It is not clear how the use of bi-lateral agreement such as BOOT contract used to determine (a) biogas sale/income price, (b) electricity tariff, (c) escalation tariff, and (d) residual value of equipment could allow a non-subjective assessment as to whether a reasonable investor would decide to proceed with a particular project	PoA-CL 5  PoA-CL 5	OK  OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
		<p>activity without the benefits of the CDM. The PP is required to clarify the same, including a justification as to how the concerns expressed by the Meth Panel (see CLA_TOOL_0012) regarding the disadvantages of the BOOT contract can be addressed in the context of the PoA. Please refer to PoA-CL 5</p> <p>Justification is necessary as to why national CPI figures can be considered as appropriate source of escalation rate for electricity tariff. As well, whether it is appropriate to assume the same as basis for escalation rate of O&amp;M cost. Please refer to PoA-CL 5</p> <p>It is not clear whether the application of zero salvage value could be regarded as the reasonable expectation of the potential profit or loss on the realisation of the assets. Please refer to PoA-CL 5</p> <p>Justification is requested as to how EPC contract and service agreement could be considered as appropriate source of total investment cost and O&amp;M cost respectively, taking into consideration para 6 of EB 62 Annex 5. Please refer to PoA-CL 5</p> <p>Justification is requested as to how TBEC accounting records for O&amp;M costs could be considered as appropriate data source for total O&amp;M cost for all CPAs. Please refer to PoA-CL 5</p> <p>Further, the stated financial parameters shown in Section E.5 are deemed incomplete and not sufficient for assessing additionality through investment analysis for all types CPAs described in Section A.2 of the published PoA-DD. Please refer to PoA-CL 5</p>	<p>PoA-CL-5</p> <p>PoA-CL-5</p> <p>PoA-CL-5</p> <p>PoA-CL-5</p> <p>PoA-CL-5</p>	<p>OK</p> <p>OK</p> <p>OK</p> <p>OK</p> <p>OK</p>
If Attachment A of Appendix B of the Modalities and Procedures was applied proceed to answer the following:				

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
E.5.1.6. Does the PoA-DD include a complete list of barriers that prevents the project activity to be implemented without CDM?		Not applicable. Attachment A of Appendix B of the M&P is not applied.	N/A	N/A
E.5.1.7. Does the PoA-DD provide explanation to show that the PoA/CPA would not have occurred anyway due to at least one of the following barriers? <ul style="list-style-type: none"> <li>Investment barrier;</li> <li>Technological barrier;</li> <li>Barrier due to prevailing practice;</li> <li>Other barriers.</li> </ul>	EB 63 Annex 24 §1	Not applicable. Attachment A of Appendix B of the M&P is not applied.	N/A	N/A
E.5.1.8. Does the barrier analysis take into account relevant national and/or sectoral policies / laws?	EB 55 Annex 1 §117	Not applicable. Attachment A of Appendix B of the M&P is not applied.	N/A	N/A
E.5.1.9. Does the CPA employ at least one of the following grid-connected renewable electricity generation technologies of installed capacity up to 15 MW, that are automatically defined as additional? (a) Solar technologies (photovoltaic and solar thermal electricity generation); (b) Off-shore wind technologies; (c) Marine technologies (wave, tidal).	EB 63 Annex 24 §2	Not applicable. Attachment A of Appendix B of the M&P is not applied.	N/A	N/A
If Investment Analysis was applied proceed to answer the following:				
E.5.1.10. Is an appropriate analysis method chosen for the project (simple cost analysis, investment comparison analysis or benchmark analysis)? <i>Describe why the selected analysis method is appropriate under consideration of potential revenues and costs, potential project alternatives and potential available benchmark values</i>	EB 55 Annex 1, §109	It is not clear whether and why the selected benchmark analysis method is appropriately chosen for all CPAs to be included in the PoA. CL is raised.	PoA-CL-5	OK
E.5.1.11. Is a clear, viewable and unprotected excel spreadsheet template available for the investment	EB 55 Annex 1, §110	Investment analysis is shown at CPA level. Hence, the validation of investment analysis spreadsheet is not relevant.	N/A	N/A

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<p>calculation, if applicable?</p> <p><i>Describe the steps taken to validate this issue</i></p>				
<p>E.5.1.12. If applicable, were the input values used in the investment analysis valid and applicable at the time of the investment decision with sufficient evidences?</p> <p><i>In case the basis for input values is a Feasibility Study Report (FSR) describe how it shall be ensured that the period in time between the finalisation of the FSR and the investment decision is sufficiently short so that it is unlikely that input values would have materially changed. Please fill out Annex 3 of this report for detailed assessment.</i></p>	EB 55 Annex 1, §111; EB 62 Annex 5	Investment analysis is shown at CPA level. Hence, the validation of specific input values is not relevant at PoA level. Nonetheless, the validation team has assessed the possible parameters and their data sources for investment analysis as referenced in Section E.5.2 of the published PoA-DD. Please refer to PoA-CL 5.	PoA-CL 5	OK
<p>E.5.1.13. If applicable, does the period chosen for the investment analysis, reflect the technical lifetime of the proposed CPA or in case a shorter period is chosen, is the fair value of the project activity's assets at the end of the investment analysis period (as a cash inflow) included?</p>	EB 55 Annex 1, §111; EB 62 Annex 5	Investment analysis is shown at CPA level. Hence, the validation of specific input values is not relevant at PoA level. Nonetheless, the validation team has assessed the possible parameters and their data sources for investment analysis as referenced in Section E.5.2 of the published PoA-DD. Please refer to PoA-CL 5.	PoA-CL 5	OK
<p>E.5.1.14. If applicable, has the fair value calculation included book value and expected potential profit or loss, and in accordance with local accounting regulations (where available) or international best practice?</p>	EB 55 Annex 1, §111; EB 62 Annex 5	Please refer to PoA-CL 5	PoA-CL 5	OK
<p>E.5.1.15. If applicable, is the book value as well as the expectation of the potential profit or loss included in the fair value calculation?</p>	EB 55 Annex 1, §111; EB 62 Annex 5	Please refer to PoA-CL 5	PoA-CL 5	OK
<p>E.5.1.16. If applicable, are depreciation and other non-cash related items added back to net profits for the purpose to calculate the financial indicator?</p>	EB 55 Annex 1, §111; EB 62 Annex 5	Investment analysis is shown at CPA level. Hence, the validation of specific input values is not relevant at PoA level. Nonetheless, based on review and assessment of Section E.5 of the published PoA-DD, it is not clear whether pre-tax or post-tax IRR will be calculated to demonstrate additionality of a typical CPA. Moreover, the PoA-DD	PoA-CL 5	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
		shall ensure that IRR calculation and benchmark selection properly and consistently takes into account the effect of tax as applicable. Please refer to PoA-CL 5		
E.5.1.17. If applicable, is taxation excluded in the investment analysis or is the benchmark intended for post tax comparisons?	EB 55 Annex 1, §111; EB 62 Annex 5	Please refer to PoA-CL 5	PoA-CL 5	OK
E.5.1.18. In case of project IRR: Are the costs of financing expenditures (loan repayments and interests) excluded from the calculation of project IRR?	EB 55 Annex 1, §111; EB 62 Annex 5	Investment analysis is shown at CPA level. Hence, the validation of specific input values is not relevant at PoA level. Nonetheless, based on review and assessment of Section E.5 of the published PoA-DD, it is not clear whether cost of financing expenditures will be excluded in the case that project IRR is calculated. Please refer to PoA-CL 5	PoA-CL 5	OK
E.5.1.19. In case of equity IRR: Is the part of the investment costs, which is financed by equity considered as net cash outflow and is the part financed by debt excluded in net cash outflow?	EB 55 Annex 1, §111; EB 62 Annex 5	Investment analysis is shown at CPA level. Hence, the validation of specific input values is not relevant at PoA level. Nonetheless, based on review and assessment of Section E.5 of the published PoA-DD, it is not clear whether in the case of equity IRR is calculated the parts of the investment costs financed by equity will be considered as net cash outflow, as well as whether the part financed by debt will be excluded in net cash outflow. Please refer to PoA-CL 5.	PoA-CL 5	OK
If Benchmark Analysis was applied proceed to answer the following:				
E.5.1.20. If applicable, is the type of benchmark chosen appropriate for the type of IRR calculated (e.g. local commercial lending rates or weighted average costs of capital for project IRR; required/expected returns on equity for equity IRR)?	EB 55 Annex 1, §111; EB 62 Annex 5	As per Section E.5.1 of the published PoA-DD, the type of benchmark selected for comparison with project IRR will be weighted average cost of capital (WACC), which is assessed by the validation team as appropriate. Further, Section E.5.1 of the published PoA-DD stated that cost of equity/benchmark for equity IRR will be Return on Equity (ROE) that is published by national stock market for companies that face a similar risk profile to the CPA. However, it is not clear whether this is an appropriate source for cost of equity that has been calculated using best financial practices. Please refer to PoA-CL 5.	PoA-CL 5	OK

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E.5.1.21. If applicable, is the benchmark value suitable for the project activity, e.g., it has been consistently used in the past for similar projects with similar risks, and is it reasonable to assume that no investment would be made at a rate of a lower return than the benchmark?	EB 55 Annex 1, §111; EB 62 Annex 5	This applied if internal benchmark is chosen, which is not relevant as per Section E.5.1 of the published PoA-DD.	N/A	N/A
E.5.1.22. If applicable, is it ensured that the project cannot be developed by other developers than the PP?	EB 55 Annex 1, §111; EB 62 Annex 5	<i>Ditto</i>	N/A	N/A
E.5.1.23. In case of financial additionality justification; has a sensitivity analysis been considered and does the same contain variation of parameters that constitute more than 20% of either total project costs or total project revenues and may vary throughout the project lifetime?	EB 55 Annex 1, §§110, 111 (e); 120 (e); EB 62 Annex 5	As per Section 5.1 of the published PoA-DD, a sensitivity analysis will be applied as to show that the conclusion regarding the financial economic attractiveness is robust to reasonable variations in the critical assumptions. Further, it is to be noted that investment analysis will be shown at CPA level; hence the assessment of variation of parameters is not relevant at PoA-level.	N/A	N/A
E.5.1.24. If applicable, have sensitivity analysis considered parameters constituting less than 20% of total project costs or revenues, which may have potential material impact on the financial parameter?	EB 55 Annex 1, §110; EB 62 Annex 5	<i>Ditto</i>	N/A	N/A
E.5.1.25. If applicable, is the range of variation reasonable in the specific context of the project activity, taking into consideration historic trends in the business sector?	EB 55 Annex 1, §110; EB 62 Annex 5	<i>Ditto</i>	N/A	N/A
E.5.1.26. If applicable, are there any barriers given which have a clear and direct impact on the financial returns of the project?	EB 55 Annex 1, §§ 115, 137	As per Section 5.1 of the published PoA-DD, additionality of CPA shall be demonstrated using investment analysis approach and there is no reference in the same section that suggests any barriers that will have a clear and direct impact on the financial returns of the project. However, please refer to PoA-CAR 11.	<del>PoA-CAR 11.</del>	OK
E.5.1.27. If applicable, are the barriers described risk	EB 55 Annex 1,	Please refer to PoA-C AR 11.	<del>PoA-CAR 11.</del>	OK

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related (e.g technology failure, other performance related risks) or has the availability of sources of finance for the project been described and adequately substantiated?	§§ 115, 137			
E.5.1.28. If applicable, has it been justified that one or a set of real barriers prevent(s) the implementation of the project activity and do not prevent the implementation of at least one of the alternatives?	EB 55 Annex 1, § 117 (b)	Please refer to PoA-C AR 11.	PoA-CAR 11.	OK
E.5.1.29. Is the defined region for the common practice analysis appropriate for the technology/industry type?	EB 55 Annex 1, § 120	As per the published PoA-DD, the application of common practice analysis is lacking. Please refer to PoA-CAR 10, 16	<del>PoA-CAR 10</del> <del>PoA-CAR 16</del>	OK
E.5.1.30. Is it appropriately explained how the approval of the project activity will help to overcome the identified barriers?		Please refer to PoA-CAR 11.	PoA-CAR 11	OK
<b>E.5.2. KEY CRITERIA and data for assessing additionality of a CPA</b>				
E.5.2.1. Has section E.5.1 of the PoA-DD provided unambiguous criteria to assess a typical CPA's additionality as demonstrated in section E.5.1 of the PoA-DD? Are these criteria described as verifiable at the time of CPA inclusion? <i>Discuss the appropriateness of the criteria established. Please consider also the eligibility criteria as discussed above. Assess whether the PP has demonstrated how these criteria would be applied to assess the additionality of a typical CPA at the time of CPA inclusion.</i>	EB 55 Annex 1, §108	In Section E.5.1 of the published PoA-DD, the PP has identified a summary of the steps used to demonstrate the additionality for a typical CPA following the additionality tool. The validation team has assessed the described approach as not clear, ambiguous and incomplete, as well as requiring justification on their appropriateness for all the CPAs to be included in the PoA. Moreover, the criteria developed for assessment of additionality just refers to parameters and data sources to be used in the investment analysis, which are deemed neither comprehensive nor completely verifiable. CAR is raised. Please also refer to the findings raised in Section E.5.1 above.	<del>PoA-CAR 20</del>  <del>PoA-CAR 10-11 and 16.</del> <del>PoA-CL 5</del>	OK
E.5.2.2. Are there any other key criteria and data for assessing additionality of a CPA which are necessary besides the ones mentioned above not included in the	EB 55 Annex 1, § 167	Kindly refer to above section. PoA-CAR 20, PoA-CAR 10-11, and 16. PoA-CL 5	<del>PoA-CAR 20,</del> <del>PoA-CAR 10-11 and 16.</del>	OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
PoA-DD?			PoA-CL 5	
E.6. Estimation of Emission reductions of a CPA				
E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical CPA				
<p>E.6.1.1. In case the methodology allows for different methodological choices, are the equations applied properly justified and have they been used reflecting the other methodological choices (i.e. baseline identification) and are they in line with the actual situation verified on-site?</p> <p><i>Assess the correct selection and application of methodological choices. Describe whether proper justification has been provided (based on the choice of the baseline scenario, context of a typical CPA and other evidences provided) and whether the correct equations have been used reflecting the relevant methodological choices.</i></p>	EB 55 Annex 1 §§ 90, 91	<p>The following findings have been raised regarding the justification of applied equations and methodological choices as per ACM0014:</p> <p>First, please refer to PoA-CL 4 regarding the eligibility of scenario 2 and correspondingly the PP's choice in estimating emission reductions calculation.</p> <p>Second, based on Section A and E.1 of the published PoA-DD, the PoA does not cover the case whereby the wastewater in the project scenario of the CPA is dewatered or directed to land application. Moreover, such scenario is stated in Section E.4 of the published PoA-DD as not in compliance with the Thai regulations. Hence, justification is needed as to why reference to equation/methodological choice of the same has still been included in Section E.6.2 of the published PoA-DD. The POA-DD to be revised as appropriate. CL is raised.</p> <p>Please also refer to PoA-CL 4 regarding compliance of baseline alternatives to local regulations.</p> <p>Provision regarding the methodological choice/equation for the calculation of COD lost through sedimentation in the lagoon or sludge pit, grid emission factor, methane emissions from flaring, electricity consumption, fossil fuel consumption, and leakage emissions are not provided in section E.6 of the PoA-DD.. CAR is raised.</p>	<p>PoA-CL 4</p> <p>PoA-CL 6</p> <p>PoA-CL 4</p> <p>PoA-CAR 24</p>	<p>OK</p> <p>OK</p> <p>OK</p> <p>OK</p>
E.6.1.2. In case the implementation of a typical CPA leads to	EB 55 Annex 1,	Pending closure of PoA-CAR 19	PoA-CAR 19	OK

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<p>GHG emissions within the CPA boundary which are expected to contribute more than 1% of the overall expected average annual emission reductions, which are not addressed by the methodology, has this parameter been included in the calculation of the emission reductions?</p> <p><i>Please describe the extra parameters defined and Calculated.</i></p>	§77			
<b>E.6.2. EQUATIONS, incl. fixed parametric values, to be used for calculation of ER of a CPA:</b>				
E.6.2.1. Are the equations for calculating emission reductions applied correctly according to the applied approved methodology?	EB 55 Annex 1 §§67 (c), 89, 90, 91	Pending closure of the findings raised in E.6.1.1 above.	<p>PoA-CL 4</p> <p>PoA-CL 6</p> <p>PoA-CAR 19</p> <p>PoA-CAR 21</p>	OK
<p>E.6.2.2. Have parameters with fixed values for the whole PoA been listed in section E.6.2 of the PoA-DD?</p> <p><i>Only those parameters which can be determined at the stage of PoA validation and will be applied consistently for each CPA shall be included in section E.6.2 of the PoA-DD. Ex-ante estimation of monitoring parameters or parameters to be reported only at CPA inclusion stage shall not be included.</i></p>	EB 33 Annex 41	Pending closure of the findings raised in E.6.1.1 above.	<p>PoA-CL 4</p> <p>PoA-CL 6</p> <p>PoA-CAR 19</p> <p>PoA-CAR 21</p>	OK
E.6.2.3. Have conservative assumptions been used when calculating the baseline emissions, project emissions and leakage?	EB 55 Annex 1 §§ 90, 91	The values of parameters defined in the published PoA-DD are in accordance with the applied methodology; hence it is assessed as acceptable and can be considered conservative for the calculation of emission reductions. However, the findings raised in E.6.1.1 above need closing out.	<p>PoA-CL 4</p> <p>PoA-CL 6</p> <p>PoA-CAR 19</p> <p>PoA-CAR 21</p>	OK
<b>E.6.3. Data and parameters that are to be reported in CPA-DD form:</b>				
E.6.3.1. Have all parameters that are to be reported in the CPA-DD form for each individual CPA completely listed in section E.6.3 of the PoA-DD as per applied methodology and tools?	EB 33 Annex 41	The parameters listed in Section E.6.3 of the published PoA-DD are in accordance with those shown in the applied methodology ACM0014. However, the same shall be presented in the standard reported parameters template as shown in the CDM-PoA-DD form.	PoA-CAR 22	OK

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<i>These parameters are either determined for the whole PoA nor listed as monitoring parameters.</i>		CAR is raised.  Moreover, please refer to PoA-CL 4, PoA-CL 6, and PoA-CAR 21.	PoA-CL 4 PoA-CL 6 PoA-CAR 21	
E.6.3.2. Are all parameters sufficiently described as per applied methodology and tools?	EB 33 Annex 41	The listed parameters in the PoA-DD are sufficiently described. However, closure of the findings raised in E.6.3.1 is pending.	PoA-CAR 22 PoA-CL 4 PoA-CL 6 PoA-CAR 21	OK
<b>E.7. DESCRIPTION of the MONITORING PLAN and PARAMETERS to be MONITORED in each CPA</b>				
<b>E.7.1. Data and parameters to be monitored by each CPA</b>				
E.7.1.1. Are the means of monitoring of all parameters contained in the monitoring plan feasible and in accordance with the requirements of the applied methodology?  <i>Assess whether the provided information for all parameters w.r.t.</i> a) label (name of the data / parameter) b) data unit c) description d) source of data e) value applied for ex-ante ER calculation f) measurement equipment / method / procedure g) QA/QC procedures h) Any comment if necessary  <i>are appropriately described and in compliance with the requirements of the methodology.</i>	EB 55 Annex 1, § 123 (a), 123 (b), 124	Section E.7 of the published PoA-DD has been assessed. By means of comparing the published PoA-DD with the applied methodology, ACM0014, the validation team has assessed that all the listed parameters are consistent. However, the standard monitoring table template has not been applied as well as lacking information on some of the monitoring and QA-QC procedures. As well, it is not clear whether Annex 4 of the published PoA-DD has intentionally been left blank. CAR is raised.  It is also not clear why all the listed parameters are relevant considering PoA-CL 4, PoA-CL 6.  Further not all the relevant monitoring parameters are listed in the published PoA-DD and consistent with the tools applied in the PoA. CAR is raised. Please also refer to PoA-CAR 16.	PoA-CAR 23          PoA-CL 4, PoA-CL 6  PoA-CAR 24	OK          OK

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CHECKLIST QUESTION / VVM AND POA REQUIREMENTS	SOURCE	MEANS AND FINDINGS OF VALIDATION	ASSESSMENT	FINAL CON.
<p>E.7.1.2. Are all monitoring parameters as required by the applied methodology contained in the monitoring plan?</p> <p><i>Assess whether all applicable parameters listed in the methodology are included in the monitoring plan.</i></p> <p><i>Pl. check further whether the selection of parameters not to be monitored is appropriate and in line with the applied methodology.</i></p> <p><i>In case of different approaches can be chosen acc. to the methodology assess whether the selection of parameters is justified and correct.</i></p>	EB 51 Annex 1, §§ 67 (e), 122, 123 (a) , 124	Please refer to PoA-CAR 24	<del>PoA-CAR 24</del>	OK
<p>E.7.1.3. If applicable, does the PoA-DD mention reasonable values for all ex-ante calculation / monitoring parameters?</p> <p><i>Describe clearly the steps taken to assess whether the values used for the monitoring parameters are considered reasonable, applicable and conservative in the context of the project activity</i></p>		Please refer to PoA-CAR 23	<del>PoA-CAR 23</del>	OK
<b>E.7.2. Description of the MONITORING PLAN for a CPA</b>				
E.7.2.1. Is it likely that the monitoring plan described in the PoA-DD can be properly implemented in the context of a typical CPA? E.g. Does the CME have trained personnel who are capable of the task? Does the management plan make provisions for meeting training and maintenance needs of the implementation of the PoA?	EB 55 Annex 1 123 (b)	Please refer to PoA-CL 2, PoA-CAR 10, PoA-CAR 23, and PoA-CAR 24	<del>PoA-CL 2</del> <del>PoA-CAR 10</del> <del>PoA-CAR 23</del> <del>PoA-CAR 24</del>	OK
E.7.2.2. Are the QA/QC procedures appropriate and sufficient to ensure the emission reductions achieved from a typical CPA can be reported ex-post and verified?	EB 55 Annex 1 123 (b)	Please refer to PoA-CL 2 and PoA-CAR 23	<del>PoA-CL 2</del> <del>PoA-CAR 23</del>	OK
E.7.2.3. Have all means of implementing the monitoring plan,	EB 55 Annex 1	Means for implementing the monitoring plan has been described in	<del>PoA-CAR 10</del>	OK

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e.g. procedures for data management, emergency preparedness, been described clearly and in line with the methodology?	123 (b), 124	Section E.7.2 of the published PoA DD. However, PoA-CAR 10, PoA-CAR 23 and PoA-CL 2 need to be closed out.	<del>PoA-CAR 23</del> <del>PoA-CL 2</del>	
E.7.2.4. Is additional background information on monitoring provided in PoA-DD annex 4? Is this information consistent with data presented in other sections of the PoA-DD and verifiable?	EB 33 Annex 41	Additional background information is not provided in Annex 4 of the published PoA-DD. However, it is not clear whether this Section has intentionally been left blank. Please refer to PoA-CAR 23.	<del>PoA-CAR 23</del>	OK
<b>E.8. DATE OF COMPLETION OF THE APPLICATION OF THE BASELINE STUDY AND MONITORING METHODOLOGY AND THE NAME OF THE RESPONSIBLE PERSON(S)/ENTITY(IES)</b>				
E.8.1. Is the date when the baseline was determined indicated correctly in PoA-DD section E.8 and is this date consistent with the project timeline?	PoA-DD	Yes, the completion date of the application of the baseline study and monitoring methodology of the PoA is correctly indicated in section E.8 of the PoA-DD as '05/12/2011', which is consistent with the project timeline, with there being less than 1 month before the PoA GSC date '21/12/2011'.	OK	OK
E.8.2. Who is/are the person(s) / entity (ies) responsible for developing the baseline studies indicated in section E.8 of the PoA-DD?	PoA-DD	As per Section E.8 of the published PoA-DD, the responsible person for developing the baseline study is: Paul Corletto.	OK	OK

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**TABLE 2** RESOLUTION OF CORRECTIVE ACTION REQUESTS (CAR), CLARIFICATION REQUESTS (CR) AND FORWARD ACTION REQUESTS (FAR)

<b>Description of Finding (CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl. (OK or not OK)</b>
<p><b>PoA -CAR 1 (09/02/2012)</b>  Following deficiencies in the description of general operating and implementing framework of the PoA have been identified:  <u>Issue 1</u>  The published PoA-DD stated that the PoA is not restricted to CPAs under direct management of TBEC. However, based on interview with host country DNA, this contradicts with the affirmative written statement TBEC has provided that the PoA will only include self-implemented CPAs. It is noted that this statement was said to have been taken in serious consideration for the process of host country approval.  <u>Issue 2</u>  The general operating and implementing framework of the PoA has not been sufficiently described in Section A.2 of the published PoA-DD e.g. roles and functions and interrelations of the CME, CPA implementer, project owner, end users and any other PPs or third parties directly involved in the operation or implementation of the PoA and CPAs have not been sufficiently explained.</p>	<p>30/03/2012 (1<sup>st</sup> round):</p> <p><u>Issue 1</u>  The PoA-DD has been revised to confirm that it will be restricted to CPAs under the direct management of TBEC.</p> <p><u>Issue 2</u>  The general operating and implementing framework of the PoA has been further described in Section A.2 of the published PoA-DD to include roles and functions and interrelations of the CME, CPA implementer, project owner, end users and any other PPs or third parties directly involved in the operation or implementation of the PoA and CPAs.</p>	<p>07/05/2012 (1<sup>st</sup> round)</p> <p><u>Issue 1</u> :  Not OK. Although the PoA-DD section A.2 has been revised as to include statement that the PoA will involve CPAs under the direct management of TBEC, this strict requirement by host country LoA has not been clearly included into Eligibility Criteria of the CPA under section A.4.2.2 of the PoA-DD.</p> <p><u>Issue 2</u> :  OK. The revised PoA-DD adequately describes in section A.2 of the PoA-DD the roles and functions of the CME and that it will coordinate with the CPA implementer, project owner and other third parties relevant for the CPAs.</p> <p><u>Issue 3</u> :  OK. The steps to identify a suitable CPA that fulfils</p>	<p>Not OK</p>

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
<u>Issue 3</u> Section A.2 of PoA-DD describes steps to identify a suitable CPA that fulfils eligibility criteria for inclusion. However, it is not appropriate to be included in this section as per the PoA-DD template.  <u>Issue 4</u> The scenarios of different project activities and baselines are repeated in this section A.2 which is not necessary and not fully consistent with the description in A.4.2.1, E.2 and E.4 of the PoA-DD.	<u>Issue 3</u> The steps to identify a suitable CPA that fulfils eligibility criteria for inclusion has been removed from section Section A.2 of PoA-DD.  <u>Issue 4</u> The scenarios of different project activities and baselines repeated in this section A.2 has been removed as they are sufficiently described in sections A.4.2.1, E.2 and E.4.	eligibility criteria for inclusion in the PoA have been removed from section A.2 of the submitted PoA-DD.  Issue 4 : OK. Section A.2 of the revised PoA-DD is corrected by removing the repetition of the description of baseline scenario.  Therefore, PoA-CAR 1 continues.	OK
POA-CAR 1 continued ...	27/05/2012 d(2 <sup>nd</sup> round): Issue 1 : The PoA-DD section A.2 has been revised as to include statement that the PoA will involve CPAs under the direct management of TBEC, and the Eligibility Criteria of the CPA under section A.4.2.2 of the PoA-DD has also been updated to include this criterion.	15/06/2012 (2 <sup>nd</sup> round): Issue 1 : OK. Validation team noted the condition that PoA will only involve CPAs under the direct management of TBEC has been included in the eligibility criteria. PoA-CAR 1 is closed.	OK
PoA -CAR 2 (09/02/2012) Demonstration on the voluntary action by the CME has not been substantiated by prevailing local regulations on the current/baseline situation, including whether there is any mandatory enforcement of the proposed	30/03/2012 (1 <sup>st</sup> round): Demonstration on the voluntary action by the CME has been substantiated by prevailing local regulations on the current/baseline situation, including whether there is any mandatory	07/05/2012 (1 <sup>st</sup> round): Not OK. Reference to local regulations has now been provided the revised PoA-DD. However, while the CPA-DD has referred to the “adder provision” in Thailand as “E-minus”, the same has neither been	Not OK

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<b>Description of Finding (CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl. (OK or not OK)</b>
project technology.	enforcement of the proposed project technology.	justified nor described in the PoA-DD. Also, for the sake of completeness, Section A.4.1.2 of the PoA-DD has also not included confirmation that all applicable national and/or sectoral policies and regulations of each host country within that chosen boundary have been taken into consideration and deemed in compliance with substantiated evidences. PoA-CAR 2 continues.	
PoA-CAR 2 continued ...	27/05/2012 (2 <sup>nd</sup> round): Section A.4.1.2 of the PoA-DD has been updated to include the “adder provision” in Thailand as “E-minus”. Also, Section A.4.1.2 of the PoA-DD has included confirmation that all applicable national and/or sectoral policies and regulations of each host country within that chosen boundary have been taken into consideration and deemed in compliance. References to local regulations have been provided as substantiated evidences.	15/06/2012 (2 <sup>nd</sup> round): Not yet OK. To promote renewable energy, through the National Energy Policy Council (NEPC), the Thai government has on 04/09/2006 approved the framework of a supportive scheme, “Adder” provision which is an additional electricity tariff on top of the normal prices, that renewable energy-based power producers under the Small Power Producer (SPP) and Very Small Power Producer (VSPP) programme can receive when selling electricity to the grid. In accordance with Annex 3 of EB22, it has been assessed and verified, through our local expertise and review of publically available information that the Adder Provision could be considered as ‘E-minus policy’ as it can clearly be regarded as national and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more	<del>Not OK</del>

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
		<p>emissions-intensive technologies. Crucially though, it is highlighted that the adder provision was implemented <u>after</u> the adoption by the COP of the CDM M&amp;P (decision 17/CP.7, 11 November 2001). With this, the validation team can conclude as acceptable to regard Adder provision as E- policy in accordance with para 7(b) of EB22, Annex 3. It is further noted that footnote 11 of the additionality tool requires the consideration the consideration of EB guidance on national/local/sectoral policies and measures for the baseline setting, hence based on the argument outlined above, the validation team concluded that the exclusion of Adder in the investment analysis has been duly justified based on relevant provisions in the additionality tool and CDM EB decision on treatment of national policies (EB22 Annex 3). As a side reference, it is mentioned here that the concept of Adder provision being an E-minus policy has been transparently highlighted during the validation of a recently registered project in Thailand (CDM ref: 5530 – see its validation report finding B7, page 36).</p> <p>Further, the PoA-DD now includes confirmation that all applicable national and/or sectoral policies and regulations of each host country within that chosen boundary have been taken into consideration and</p>	

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
		deemed in compliance with substantiated evidences. However, the same was requested in Section A.4.1.2, whereas the PP has revised Section A.4.2.1 of the PoA-DD. PoA-CAR 2 continues.	
PoA-CAR 2 continued ...	21/06/2012 (3 <sup>rd</sup> round): The changes made in the last round to Section A.4.2.1 have been moved to Section A.4.1.2	02/07/2012 (3 <sup>rd</sup> round): OK. The required changes are made in section A.4.1.2 as described in the response. PoA-CAR 2 is closed.	OK
PoA -CAR 3 (09/02/2012) Information regarding the annual average emission reductions of the PoA or the 1 <sup>st</sup> CPA over the first crediting period has not been included in the description of the PoA in section A.2 of the PoA-DD.	30/03/2012 (1 <sup>st</sup> round): Information regarding the annual average emission reductions of the PoA and the 1 <sup>st</sup> CPA has been included in the description of the PoA in section A.2 of the PoA-DD.	07/05/2012 (1 <sup>st</sup> round): Not OK. Estimated emission reductions for each CPA (based on TBEC's other registered CDM projects) and the total PoA have been included in the PoA section A.2; however, as per the PoA requesting for registration step 4 requirement, only one value that represents 'Average annual metric tonnes of CO <sub>2</sub> equivalent reductions over the first crediting period (estimated and approved)' shall be included, and the validation team deems only the 1 <sup>st</sup> CPA average annual emission reduction can be approved during course of validation, and it is unclear how the PP will consider the appropriateness of the ER values presented in the PoA-DD.	Not OK
PoA -CAR 3 continued	27/05/2012 (2 <sup>nd</sup> round): The PoA has been updated with emission reduction estimates based on the 'Average	15/06/2012 (2 <sup>nd</sup> round): OK. The submitted revised PoA-DD includes the "Average annual metric tonnes of CO <sub>2</sub> equivalent	OK

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	annual metric tonnes of CO <sub>2</sub> equivalent reductions over the first crediting period (estimated and approved)' based on the 1st CPA average annual emission reduction available at the time of Validation.	reductions over the first crediting period (estimated and approved)" based on 1 <sup>st</sup> CPA. PoA-CAR 3 is closed.	
<b>PoA –CAR 4 (09/02/2012)</b> Listed information in the table shown in Section A.3 is not fully consistent with the contact details provided in Annex I of the published PoA-DD, as name of CME/PP entity is not stated in full.	30/03/2012 (1 <sup>st</sup> round): Listed information in the table shown in Section A.3 has been updated and is fully consistent with the contact details provided in Annex I of the published PoA-DD.	07/05/2012 (1 <sup>st</sup> round): Not OK. Section A.3 is found revised to be consistent with Annex -1 of the submitted PoA-DD. However, since the company license of TBEC as well as the LoA have not been provided to crosscheck the company full name, it cannot be confirmed by the validation team yet about the consistency of the CME name. Therefore, PoA-CAR 4 continues.	Not OK
<b>PoA-CAR 4 continued ...</b>	27/05/2012 (2 <sup>nd</sup> round): The company license of TBEC has been provided to crosscheck the company full name.	15/06/2012 (2 <sup>nd</sup> round): Not OK. Through checking of company license, it is found that the official name of CME/PP is "Thai Biogas Energy Company Limited", which is not fully consistent with that stated in the PoA-DD. Moreover, the LoAs have not been provided.	Not OK
<b>PoA-CAR 4 continued ...</b>	21/06/2012 (3 <sup>rd</sup> round): In accordance with the company license, the official name of the CME/PP has been changed to Thai Biogas Energy Company Limited (TBEC) in the PoA-DD section A3 and Annex 1. The DNA has also been advised to issue the LoA	02/07/2012 (3 <sup>rd</sup> round): Not OK. Validation team confirms that the official name of the CME/PP has been revised to Thai Biogas Energy Company Limited (TBEC) in the PoA-DD and it is inline with the provided document. However, copy of LoA is yet to be submitted to	Not OK

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Description of Finding (CAR, CL, FAR) <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	Project Participants Response <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	GLC Assessment <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	Final Concl. (OK or not OK)
	with the official name.	confirm the same.	
PoA-CAR 4 continued ...	07/08/2012 (4 <sup>th</sup> round) Host country LoA is submitted for validation.	17/08/2012 (4 <sup>th</sup> round) OK. Through review of LoA, consistency between all documents can be confirmed. PoA-CAR 4 is closed.	OK
PoA-CAR 5 (09/02/2012) The letter of approval is not yet provided to the validation team.	30/03/2012 (1 <sup>st</sup> round): The letter of approval is under preparation.	07/05/2012 (1 <sup>st</sup> round): Not OK. The letter of approval (LoA) is pending. PoA-CAR 5 continues.	Not OK
POA-CAR 5 continued..	27/05/2012 (2 <sup>nd</sup> round): The letter of approval is under preparation.	15/06/2012 (2 <sup>nd</sup> round): Not OK. LoA is pending. PoA-CAR 5 continues.	Not OK
PoA-CAR 5 continued..	21/06/2012 (3 <sup>rd</sup> round): The PoA & LoA is expected to be approved at the TGO board committee on 24/6/2012 and the LoA issued shortly thereafter.	02/07/2012 (3 <sup>rd</sup> round): Not OK. Still the LoA is pending. PoA-CAR 5 continues.	Not OK
PoA-CAR 5 continued..	07/08/2012 (4 <sup>th</sup> round) Host country LoA is submitted for validation.	17/08/2012 (4 <sup>th</sup> round) OK. Host country approval was submitted by the PP. It is issued by Thailand Greenhouse Gas Management Organization on 26/07/2012. The authenticity of the letter was confirmed through direct telephone interview with host country DNA's staff. The project title and PP's information as shown in the approval is fully consistent with that shown in the PoA-DD. The approval indicated that the participation is voluntary and that Thailand is a party to the Kyoto Protocol. Moreover, the LoA clearly stated that the	OK

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		PoA will assist Thailand in achieving sustainable development. PoA-CAR 5 is closed.	
PoA-CAR 6 (09/02/2012) The Modalities of Communication is not yet provided to the validation team.	30/03/2012 (1 <sup>st</sup> round): The Modalities of Communication is under preparation.	07/05/2012 (1 <sup>st</sup> round): Not OK. The Modalities of Communication (MoC) is pending. PoA-CAR 6 continues.	Not OK
POA-CAR 6 continued..	27/05/2012 (2 <sup>nd</sup> round): The Modalities of Communication will be submitted once the LoA is approved.	15/06/2012 (2 <sup>nd</sup> round): Not OK. MoC is pending.	Not OK
POA-CAR 6 continued..	21/06/2012 (3 <sup>rd</sup> round): The MoC is submitted with this Validation Finding.	02/07/2012 (3 <sup>rd</sup> round): Not OK. MoC has been submitted to the validation team and the following points have been checked as per the UNFCCC requirements: (1) Not OK. In the MoC, title of the project 'TBEC Biogas Programme for South East Asia' is fully consistent with section A.1 of the PoA-DD. Name of project participants and sole focal point as 'Thai Biogas Energy Company Limited (TBEC)' is fully consistent with section A.3 and Annex 1 of the PoA-DD. However, there is a minor inconsistency in Annex 1 of the MoC form, that the PP name is missing '(TBEC)'; besides, since the LoA from Thailand is still pending, it cannot be assessed whether the PP name is consistent or not with the one in the LoA.	Not OK

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		<p>(2) OK. Coordinating/managing entity of the PoA is indicated as sole focal point for each area of communication with the Board;</p> <p>(3) OK. No modifications to the template/form (e.g., modifying or deleting sections of the form) have been made;</p> <p>(4) OK. Each document (MOC statement including the Annex 1) have been clearly dated;</p> <p>(5) OK. Focal point scopes have been clearly and correctly indicated as 'sole' for all areas;</p> <p>(6) OK. Contact details and specimen signatures of focal point entity including those of project participants in Annex 1 have been correctly entered and consistent with the information in Annex 1 of the PoA-DD;</p> <p>(7) OK. only one telephone, fax, e-mail contact has been entered per authorized signatory;</p> <p>(8) OK. The Statement of Agreement in Section 3 have been signed by the authorized signatory for the only project participant;</p> <p>(9) OK. Signatures made available in Section 3 corresponds to those indicated in the related Annex 1 document;</p> <p>(10) OK. Only one focal point entity who is designated as project participants has signed Section 3.</p>	

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
		PoA-CAR 6 continues.	
PoA-CAR 6 continued..	03/07/2012 (4 <sup>th</sup> round) (1) In Annex 1 of the MoC form, the title has been made fully consistent with section A.3 and Annex 1 of the PoA-DD 'Thai Biogas Energy Company Limited (TBEC)'.	13/07/2012 (4 <sup>th</sup> round) Not OK. Validation team has reviewed the submitted MoC form and confirm that the title ('Thai Biogas Energy Company Limited (TBEC)) in Annex -1 of the MoC is revised to be consistent with section A.3 and Annex -1 of the PoA-DD. However, as per the latest UNFCCC secretariat requirement via email on 5 July 2012, the form F-CDM-MOC and Annex 1 shall not be handwritten, and the update MoC has been partially handwritten. PoA-CAR 6 continues.	Not OK
PoA-CAR 6 continued..	17/08/2012 (5 <sup>th</sup> round) Updated MoC is submitted for validation.	17/08/2012 (5 <sup>th</sup> round) OK. Updated MoC has been submitted, with no part other than the signature being handwritten. PoA-CAR 6 is closed.	OK
PoA-CAR 7 (09/02/2012) Section A.4.1 of the published PoA-DD also included a map and description of South East Asia region. However, it is not in line with EB65 Annex 4 (§192 and 291) which is used as a reference guideline, when only Thailand LoA can be obtained during PoA validation process, i.e., only Thailand will be considered as the current boundary of the PoA. Accordingly, map Figure A.4.1 is incorrect.	30/03/2012 (1 <sup>st</sup> round): The map of South East Asia region has been removed from the PDD. The project boundary has been edited to reflect that only Thailand is included at the Validation stage.	07/05/2012 (1 <sup>st</sup> round): OK. It is assessed that section A.4.1 of the submitted PoA-DD is revised and the boundary of the PoA at this stage is restricted to Thailand. PoA- CAR 7 is closed.	OK
PoA-CAR 8 (09/02/2012)	30/03/2012 (1 <sup>st</sup> round):	07/05/2012 (1 <sup>st</sup> round):	OK

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
<p>In Section A.4.2.1 of the published PoA-DD, description of technology does not include other possible technologies that can be employed in this PoA, besides the new anaerobic digester system for wastewater and its possible usage of biogas recovered. Moreover, clear description regarding the differences between the CPA and the pre-project situation is not provided for the case of CPAs involving alteration of the existing installation or process.</p>	<p>Section A.4.2.1 of the published PoA-DD, description of technology has been edited to cover all possible technologies to be implemented under the PoA. The description has been updated to clarify how the CPA may alter existing installation or process.</p>	<p>OK. Section A.4.2.1 of the revised PoA-DD has been assessed as appropriate covering all possible technologies, as per the newly defined scope of the revised PoA (covering only technologies which conform to Scenario 1 in Table 1 of ACM0014). It is also assessed that the description regarding the differences between the CPA and the pre-project situation is provided correctly. PoA-CAR 8 is closed.</p>	
<p><b>PoA-CAR 9 (09/02/2012)</b> Description of a typical CPA in the published PoA-DD does not include the information on whether the applied technology in the project activity is environmentally safe and sound. Furthermore, the information on technology transfer is also not included in section A.2 of the PDD.</p>	<p>30/03/2012 (1<sup>st</sup> round): Description of a typical CPA in the published PoA-DD has been updated to include the information on whether the applied technology in the project activity is environmentally safe and sound. Furthermore, the information on technology transfer has been included in section A.2 of the PDD.</p>	<p>07/05/2012 (1<sup>st</sup> round): Not OK. Information on the technology transfer and whether the applied technology is environmentally safe and sound is found presented in the PoA-DD. However, statement that "the PoA will involve technology transfer with the use of Jencacher engines" can be interpreted as all CPAs will involve power generation, which is not consistent with that described in several parts of the PoA-DD. PoA-CAR 9 continues.</p>	<p><del>Not OK</del></p>
<p><b>POA-CAR 9 continued..</b></p>	<p>27/05/2012 (2<sup>nd</sup> round): The statement that "the PoA will involve technology transfer with the use of Jencacher engines" has been clarified as follows: "The PoA will involve technology transfer. For example, Jenbacher gas engines (or other biogas engines of appropriate quality) imported to Thailand for</p>	<p>15/06/2012 (2<sup>nd</sup> round): OK. The updated PoA-DD has been assessed as having provided adequate and appropriate description of environmentally safe and sound technology as well as information on technology transfer. PoA- CAR 9 is closed.</p>	<p>OK</p>

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	use in any CPA for which such biogas engine technology is determined to be appropriate. The use of Jenbacher engines (and the generation of electricity) is not a mandatory requirement for all CPAs in this PoA."		
<b>PoA-CAR 10 (09/02/2012)</b> Following deficiencies of the eligibility criteria defined in the published PoA-DD for inclusion of a CPA under the PoA have been identified: <u>Issue 1</u> Description regarding the eligibility criterion on conditions to avoid double counting of emission reductions is not precise and it is not clear how the same can be confirmed through either (1) UNFCCC or other GHG databases, and (2) contractual agreement relating to carbon credit. Moreover, the description regarding reference/ supporting document for assessing this eligibility criterion in Section A.4.2.2 is not fully consistent with that provided in Section A.4.4.1 of the published PoA-DD. As well, it is not clear under what specific condition it is suitable for the CME to enter into contractual arrangements with the owner of the CPA facility, as suggested in the published PoA-DD, to demonstrate compliance with this eligibility criterion.	30/03/2012 (1 <sup>st</sup> round): <u>Issue 1</u> Description regarding the eligibility criterion on conditions to avoid double counting has been revised to provide greater clarity. The description regarding reference/ supporting document for assessing this eligibility criterion in Section A.4.2.2 is now fully consistent with that provided in Section A.4.4.1. The requirement for contractual arrangements has been removed.	07/05/2012 (1 <sup>st</sup> round): <u>Issue 1</u> Not OK. Although the PP will review the UNFCCC's database for registered projects and CPAs included in other PoAs, it remains not clear how avoidance of double counting can be confirmed in case of registered projects in other GHG programmes.  <u>Issue 2</u> Not OK. The eligibility criteria are revised to include	Not OK

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<p><u>Issue 2</u> The eligibility criteria have not included the specifications of technology/ measure including the level and type of service, performance specifications including compliance with testing/certifications.</p> <p><u>Issue 3</u> Condition to check the CPA start date through documentary evidence has not been included in the eligibility criteria.</p> <p><u>Issue 4</u> Condition to ensure compliance with applicability conditions and other requirements of methodology and tools applied by CPAs have not been described in the eligibility criteria.</p> <p><u>Issue 5</u> The eligibility criteria included conditions to ensure that CPAs meet the requirements pertaining to the demonstration of additionality. However, as per EB65 Annex 3, PoAs that consist of one or more large scale projects as CPAs shall include the eligibility criteria</p>	<p><u>Issue 2</u> The eligibility criteria have been updated with the specifications of technology/ measure including the level and type of service, performance specifications including compliance with testing/certifications.</p> <p><u>Issue 3</u> A condition to check the CPA start date through documentary evidence has been included,</p> <p><u>Issue 4</u> The condition to ensure compliance with applicability conditions and other requirements of methodology and tools applied by CPAs has not been described in the eligibility criteria.</p> <p><u>Issue 5</u> The eligibility criteria have been updated to include the eligibility criteria derived from all the relevant requirements contained in the</p>	<p>the technology/measure including the CPA service; however, the specifications of technology w.r.t. national regulation, the level of service and performance specifications are not included.</p> <p><u>Issue 3</u> Not OK. Through the submitted PDD review, validation team confirms that a condition to check the CPA start date through documentary evidence is included in PoA-DD; however, it is not clearly indicated in the eligibility criteria what is the actual date of the 'start date of validation of the PoA' as in dd/mm/yyyy format.</p> <p><u>Issue 4</u> Not OK. The response does not address the finding.</p> <p><u>Issue 5</u> Not OK. Based on the document review, validation team confirms that the eligibility criteria stated in the revised PoA-DD includes the relevant requirements contained in the additionality section of the large</p>	

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<p>derived from all the relevant requirements contained in the additionality section of the large scale methodology, while the requirements embedded in the latest version of the additionality tool has not been fully taken into account in the published PoA-DD.</p> <p><u>Issue 6</u> Local stakeholder consultation prior to inclusion of the CPA has not been included in the eligibility criteria.</p> <p><u>Issue 7</u> Environmental analysis requirement of the CPA has not been included in the eligibility criteria.</p> <p><u>Issue 8</u> A target group and distribution mechanisms have not been identified in the eligibility criteria. It is not clear why this is not considered as applicable.</p> <p><u>Issue 9</u> Public funding requirement of the CPA has not been</p>	<p>additionality section of the large scale methodology.</p> <p><u>Issue 6</u> Local stakeholder consultation prior to inclusion of the CPA has been included in the eligibility criteria.</p> <p><u>Issue 7</u> Environmental analysis requirement of the CPA has been included in the eligibility criteria.</p> <p><u>Issue 8</u> A target group has been identified in the eligibility criteria. The distribution method is not considered relevant to this PoA because project equipment will be constructed rather than distributed.</p> <p><u>Issue 9</u></p>	<p>scale methodologies; however, the 'Reference/ Supporting documents' has only referred to 'CPA-DD Specific', which cannot be considered sufficient. Besides, the criteria listed in 'Description' are not fully consistent with the information in section E.5.2 of the PoA-DD.</p> <p><u>Issue 6</u> OK. Local stakeholder consultation prior to inclusion of CPA is transparently stated in the revised PoA-DD.</p> <p><u>Issue 7</u> OK. Validation team has found that the environmental analysis requirement of the CPA has been included in the eligibility criteria.</p> <p><u>Issue 8</u> OK. Eligibility criteria of the PoA-DD include the target group as all installations with an industrial wastewater treatment facility. It is also noted that the first specific CPA involves wastewater treatment in the palm oil industrial, which is assess as belonging to this broadly defined target group. Further, it is deemed as reasonable to conclude on the irrelevance of distribution mechanism in the context</p>	

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<p>included in the eligibility criteria.</p> <p><u>Issue 10</u> Provisions to ensure that those operating the CPA are aware and have agreed that their activity is being subscribed to the PoA have been included as condition for CPA inclusion. However, inconsistency has been detected in the description of this eligibility criterion with its reference and supporting document.</p> <p><u>Issue 11</u> Provisions to ensure that the CPA crediting period not exceed the PoA end date has not been included in the eligibility criteria.</p> <p><u>Issue 12</u> Although it is stated elsewhere in the published PoA-DD that TBEC will ensure that each CPA identified for inclusion in this PoA meets the necessary requirements outlined in the PoA-DD, the condition that the CPA shall be approved by the coordinating entity has not been explicitly included in the eligibility criteria.</p> <p><u>Issue 13</u> Regarding eligibility criterion to ensure that the CPA implementer is undertaking a voluntary action and is not implementing a mandatory policy/regulation, unless both entities are same, it is not sufficient to simply rely</p>	<p>Public funding requirement of the CPA has been included in the eligibility criteria.</p> <p><u>Issue 10</u> The inconsistency between the description and reference/supporting document of the provisions to ensure that those operating the CPA are aware and have agreed that their activity is being subscribed to the PoA have been included as condition for CPA inclusion has been corrected.</p> <p><u>Issue 11</u> Provisions to ensure that the CPA crediting period not exceed the PoA end date has been included.</p> <p><u>Issue 12</u> The condition that the CPA shall be approved by the coordinating entity has been explicitly included in the eligibility criteria.</p> <p><u>Issue 13</u> The eligibility criterion to ensure that the CPA implementer is undertaking a voluntary action and is not implementing a mandatory policy/regulation has been updated to include provision for a cross-checked by the CME.</p> <p><u>Issue 14</u></p>	<p>of the PoA.</p> <p>Issue 9 OK. The response is found reflected in the submitted revised PoA-DD. It is noted the PoA-DD specified that funding for each CPA will not result in a diversion of official development assistance, which is assessed as appropriate.</p> <p>Issue 10 OK. It was found that the inconsistency is corrected appropriately in the eligibility criteria of the revised PoA-DD.</p> <p>Issue 11 OK. The eligibility criteria in the revised PoA-DD contain the provision to ensure that the CPA crediting period not exceed the PoA end date.</p> <p>Issue 12 OK. It was found the revised PoA-DD included the condition that CPA shall be approved by the coordinating entity.</p> <p>Issue 13 OK. The response is found reflected in the submitted revised PoA-DD.</p> <p>Issue 14 Not OK. The documents to demonstrate the eligibility</p>	

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
<p>on the CPA implementer to state that it is a voluntary initiative; the same must be cross-checked by the CME.</p> <p><u>Issue 14</u></p> <p>Further, most of the reference/ supporting documents cited as proofs for demonstrating compliance to the eligibility criteria are said to be under preparation and were not shown to the validation team during the site visit assessment. Hence, demonstration is missing on how all the eligibility criteria can be verifiable.</p>	<p>The reference/ supporting documents cited as proofs for demonstrating compliance to the eligibility criteria are under preparation.</p>	<p>criteria are yet to be submitted to the validation team. Besides, the eligibility criteria are not numbered.</p> <p>PoA-CAR 10 continues.</p>	
<p>POA-CAR 10 continued..</p>	<p>27/05/2012 (2<sup>nd</sup> round):</p> <p><u>Issue 1</u></p> <p>The eligibility criterion on conditions to avoid double counting has been revised to require that the CPA implementer provide a written statement to confirm that the CPA is not registered to any other UNFCCC project or program nor registered with any other GHG program.</p> <p><u>Issue 2</u></p> <p>The eligibility criteria is revised to include the technology/measure including the CPA service; the level of service and performance specifications. Relevant national regulations</p>	<p>15/06/2012 (2<sup>nd</sup> round):</p> <p>Issue 1</p> <p>Not OK. In section A.4.2.2: The eligibility criteria condition to avoid the double counting has been found revised and in line with the response. The validation team has also reviewed Appendix of TBEC CPA Inclusion Management System (version 1.0, May 2012) – template of “Agreement that CPA Developer/Implementer are aware of and have agreed that their activity is being subscribed to the TBEC Biogas Programme for South East Asia” and can confirm that the procedure is in place. However, it remains not clear how avoidance of double counting can be confirmed in case of registered projects in other GHG programmes, since as per PoA Standards each eligibility criterion shall be verifiable.</p>	<p>Not OK</p>

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	<p>listed in section Section A.4.1.2 of the PoA-DD do not specify any level of service or performance specification including compliance with testing/certifications. Therefore, TBEC have developed their own criteria for level of service, performance specification and compliance with testing.</p> <p>Level of service: Production of energy in the form of biogas with methane content greater than 40% (weight basis) and COD removal ratio greater than 50% between the digester inlet and outlet.</p> <p>At the time of CPA inclusion, testing/certification is not required due to the nature of the CPA projects which will involve construction of site specific processing facilities at industrial installations. The design process flow diagram and design specifications provided by engineering consultants or equipment suppliers is sufficient to demonstrate compliance with the above level of service.</p> <p><u>Issue 3</u></p> <p>The PoA-DD is updated to clearly indicate in the eligibility criteria that the actual date of the 'start</p>	<p>Issue 2 :</p> <p>Not OK. As per our local expertise, there are no national regulations that specify any level of service or performance specification including testing/certifications. Hence, it is deemed as acceptable to rely on self-developed criteria by TBEC which have been assessed as reasonable in the context of the PoA. However, it is noted that these criteria have not been properly integrated into TBEC CPA Inclusion Management System (version 1.0, May 2012).</p> <p>Issue 3</p> <p>OK. In section A.4.2.2, the eligibility criteria pertaining to this actual start date of the validation of the PoA is appropriately updated. Moreover, the same is also reflected in TBEC CPA Inclusion Management System (version 1.0, May 2012).</p>	

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	<p>date of validation of the PoA' is 21/12/2011.</p> <p><u>Issue 4</u> The condition to ensure compliance with applicability conditions and other requirements of methodology and tools applied by CPAs has been described in the eligibility criteria.</p> <p><u>Issue 5</u> The eligibility criteria stated in the revised PoA-DD includes the relevant requirements contained in the additionality section of the large scale methodology; and the 'Reference/ Supporting documents' updated to refer to the specific requirements of the large scale methodology.</p> <p>The criteria listed in 'Description' have been made fully consistent with the information in section E.5.2 of the PoA-DD.</p> <p><u>Issue 14</u> Document templates used to demonstrate the eligibility criteria are shown in Annexes to the</p>	<p><u>Issue 4</u> OK. The response is appropriately revised and adequate revision has been made to the description of the eligibility criteria. Moreover, the same is also reflected in TBEC CPA Inclusion Management System (version 1.0, May 2012).</p> <p><u>Issue 5</u> OK. This eligibility criteria in section A.4.2.2 of the PoA-DD is appropriately revised to include transparent information of the reference/supporting documents, to ensure that compliance with (a) "Tool for the demonstration and assessment of additionality" Version 6.0.0, EB65, Annex 21, (b) "Guidelines on the assessment of investment analysis" Version 5.0.0., EB62, Annex 5, and (c) "Guidelines for objective demonstration and assessment of barriers", Version 1.0, EB50 Annex 13, will be recorded in the CPA-DD. Moreover, the criteria listed in description are updated to be fully consistent with information in section E.5.2 of the PoA-DD.</p> <p><u>Issue 14</u> Not OK. In relation to eligibility criterion 6 ("the CPA is</p>	

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	TBEC CPA Inclusion management System which has been submitted to the validation team. The eligibility criteria have also been numbered.	uniquely identifiable"); extract of CME's PoA database is to be submitted for validation. Moreover, please refer to Issue 1 & 2 above. PoA-CAR 10 continues.	
PoA-CAR 10 continued.	21/06/2012 (3 <sup>rd</sup> round): Issue 1 Criteria 7 of the eligibility criteria in Section A.4.2.2 has been updated to ensure this criteria is verifiable. It has been updated to also include the statement that "the CME will review the UNFCCC CDM online database verifying this CPA is not registered either as a CDM project activity or as a CPA of another PoA". The same has been updated in the CPA Inclusion Management System (version 2.0, June 2012). In addition, an updated signed statement has been provided that includes this relevant statement.  Issue 2 The changes made to Criteria 8 in Section A.4.2.2 in the PoA-DD have now been integrated into TBEC CPA Inclusion Management System (version 2.0, June 2012). The flow chart in figure A.2.a, which was not fully consistent with the	02/07/2012 (3 <sup>rd</sup> round):  Issue 1 OK. The eligibility criterion #7 has been revised in the PoA-DD as to ensure that the CPA to be included in this PoA is neither registered as a CDM project activity nor as a CPA of another PoA. It is also detailed that the CME will review the UNFCCC CDM online database for confirmation on the same. In addition, the agreement template has been revised as to reflect this response. Overall, the revisions in both the PoA-DD and supporting document have been assessed as completely verifiable and inline with the relevant PoA requirements.  Issue 2 OK. Validation team has assessed that the eligibility criterion #8 is now fully integrated into the updated TBEC CPA inclusion management system (version 2.0, June 2012). As a side note, flow chart in section A.4.2.2 is also found removed as per the provided	OK

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	<p>eligibility criteria, has been removed from section A.4.2.2 because the CPA Inclusion Management System inclusion describes the process in full and therefore the flow chart is redundant.</p> <p>Issue 14 In order to demonstrate eligibility criterion 6 ("the CPA is uniquely identifiable"); an extract of TBECs PoA database is to be submitted for validation.</p>	<p>response.</p> <p>Issue 14 OK. The CME TBEC has submitted the extract of the database in order to demonstrate compliance with eligibility criterion # 6 ("the CPA is uniquely identifiable"). It is further noted that both Issue 1 and Issue 2 of PoA-CAR 10 have been closed as detailed above. In all, sample all reference/supporting documents cited as proofs for demonstrating compliance with the eligibility criteria have been submitted for validation and it is assessed that all the eligibility criteria can be verifiable. PoA-CAR 10 is closed.</p>	
<p><b>PoA-CAR 11 (09/02/2012)</b> Section A.4.3 of the published PoA-DD, stated that the additionality for activities under this PoA will be demonstrated at CPA level in accordance with the latest version of the additionality tool. However, it is further mentioned that to demonstrate the additionality for each activity under a CPA the project implementer will choose to apply either an investment analysis, or investment and barrier analysis as opposed to following all the relevant steps in the additionality tool; which as well such approach is not consistent with the</p>	<p>30/03/2012: (1<sup>st</sup> round): Section A.4.3, Section A.4.2.2 as well as Section E.5.1 have been updated to ensure a consistent description of the additionality.</p> <p>An affirmative statement has been provided in Section A.4.3 that the CPAs will not be implemented in the absence of the PoA.</p>	<p>07/05/2012 (1<sup>st</sup> round): OK. The PoA-DD was reviewed and found that the latest version of the additonality tool version 6.0.0 will be applied and the same has been consistently referenced throughout the revised PoA-DD.</p> <p>Section A.4.3 is also found updated to include an affirmative statement that the CPAs will not be implemented in the absence of the PoAs. PoA-CAR 11 is closed.</p>	<p>OK</p>

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eligibility criteria stated in Section A.4.2.2 as well as Section E.5.1. Further, there is no affirmative statement in Section A.4.3 that the CPAs will not be implemented in the absence of the PoA.			
<b>PoA-CAR 12 (09/02/2012)</b> Information on the use of public funding, esp. ODA from Annex I countries for implementing the PoA has not been clarified in Annex 2 of the published PoA-DD.	30/03/2012 (1 <sup>st</sup> round): Annex 2 of the PoA-DD has been updated to confirm that PoA will not use any ODA from Annex 1 countries.	07/05/2012 (1 <sup>st</sup> round): Not OK. Annex- 2 of the PoA-DD is found updated. It is confirmed that the PoA will not use any ODA from Annex -1 countries. However, CME confirmation letter is not submitted to the validation team. PoA-CAR 12 continues.	<del>Not OK</del>
<b>PoA-CAR 12 continued ...</b>	27/05/2012 (2 <sup>nd</sup> round): CME confirmation letter is submitted to the validation team regarding ODA from Annex I countries.	15/06/2012 (2 <sup>nd</sup> round): OK. CME confirmation letter regarding the non –use of ODA from Annex-1 countries is provided to the validation team. The information is also consistent with that stated in PoA-DD. PoA-CAR 12 is closed.	OK
<b>PoA-CAR 13 (09/02/2012)</b> The start date of the PoA has not been indicated using the following format: dd/mm/yyyy. Moreover, it has not been stated as at least 8 weeks after the estimated submission (request for registration) date.	30/03/2012 (1 <sup>st</sup> round): The start date of the PoA has not been indicated using the following format: dd/mm/yyyy and stated as at least 8 weeks after the estimated submission (request for registration) date.	07/05/2012 (1 <sup>st</sup> round): Not OK. Start date of the PoA is stated as 31/12/12. Although, it has been stated as at least 8 weeks after the estimated submission date of documents to UNFCCC for PoA registration, the editorial mistake regarding formatting (yy is included instead of yyyy) is not corrected. PoA-CAR 13 continues.	<del>Not OK</del>

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PoA-CAR 13 continued ...	27/05/2012 (2 <sup>nd</sup> round): The editorial mistake regarding formatting (yy is included instead of yyyy) is corrected.	15/06/2012 (2 <sup>nd</sup> round): OK. The editorial mistake in stating the date is appropriately revised. PoA-CAR 13 is closed.	OK
PoA-CAR 14 (09/02/2012) Information regarding the requirement of EIA for a typical CPA included in the PoA is not included in Section C.3 of the published PoA-DD.	30/03/2012 (1 <sup>st</sup> round): Information regarding the requirement of EIA for a typical CPA included in the PoA is included in Section C.3 of the published PoA-DD.	07/05/2012 (1 <sup>st</sup> round): OK. It was found that section C.3 of the revised PoA-DD includes the information regarding the requirement of EIA. The same has been assessed as appropriate and in compliance with local regulations. PoA-CAR 14 is closed.	OK
PoA-CAR 15 (09/02/2012) It is stated in Section D.1 of the published PoA that: "Stakeholder comments will be invited at both PoA- and CPA-level. Local stakeholder's comments will be invited at the CPA level". It is evident that the above referred two sentences are not consistent. It is also not appropriate to perform stakeholder consultation at both levels. Moreover, justification on the choice of the level of local stakeholder comments being invited has not been provided in Section D.1 as required by PoA-DD template.	30/03/2012: (1 <sup>st</sup> round): Section D.1 of the published PoA has been revised to specify that the Stakeholder comments will be invited at CPA-level.	07/05/2012 (1 <sup>st</sup> round): OK. The response is reflected in the submitted revised PoA-DD. It has also been assessed that adequate justification has been provided regarding the level of stakeholder comments to be invited. PoA-CAR 15 is closed.	OK
PoA-CAR 16 (09/02/2012) The published PoA-DD has not explicitly and completely stated all the applicable tools/guideline, including version numbers. Latest version of the tools	30/03/2012 (1 <sup>st</sup> round): The PoA-DD has been revised to completely stated all the applicable tools/guideline, including	07/05/2012 (1 <sup>st</sup> round): OK. PoA-DD has been adequately revised to include the applicable tool/ guidelines including the valid	OK

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<p>has also not been consistently referenced throughout the PoA-DD.</p>	<p>version numbers. Latest version of the tools have been consistently referenced throughout the PoA-DD.</p>	<p>version numbers. PoA-CAR 16 is closed.</p>	
<p><b>PoA-CAR 17 (09/02/2012)</b> Section E.2 of the published PoA-DD does not substantiate the applicability criteria in the applied tools and their fulfilment by a typical CPA.</p>	<p>30/03/2012 (1<sup>st</sup> round): Section E.2 of the published PoA-DD substantiates the applicability criteria in the applied tools and their fulfilment by a typical CPA.</p>	<p>07/05/2012 (1<sup>st</sup> round): Not OK. Generally, the submitted revised PoA-DD adequately substantiates the applicability criteria with respect to the methodology, applied tools and additionality tool. However, following deficiencies in the approach for demonstrating CPAs' applicability have been found:</p> <ol style="list-style-type: none"> <li>1. Regarding applicability criterion #1 listed in the revised PoA-DD, it is not clear how physical inspection of a Greenfield site alone will be sufficient to confirm the CPAs' baseline scenario in accordance with Scenario 1 of ACM0014;</li> <li>2. Regarding applicability criterion #11 listed in the revised PoA-DD, confirmation is requested as to whether it is the intention of the PoA to limit that "gas combusted in flare is only supplied from the CLBR" (please refer to criterion 11 of the applicability condition shown in the revised PoA-DD), while other technology may also be possible.</li> </ol>	<p>Not OK</p>

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		PoA-CAR 17 continues.	
PoA-CAR 17 continued ...	<p>27/05/2012 (2<sup>nd</sup> round):</p> <ol style="list-style-type: none"> <li>1. The applicability criteria has been updated as follows: In the case of Greenfields projects, the proposed site will be inspected to confirm that an existing facility does not exist and the procedure for the identification of the most plausible baseline scenario in ACM0014 as outlined in Section E.4 will be applied.</li> <li>2. It is not the intention of applicability criterion #11 to limit the PoA such that "gas combusted in flare is only supplied from the CLBR". Therefore, applicability criterion #11 has been revised as follows: "The residual gas stream to be flared will be obtained from decomposition of organic material (through anaerobic lagoons). The CME will confirm this through review of the project design drawings indicating that the flare is supplied with a gas stream originating from the decomposition of organic material."</li> </ol>	<p>15/06/2012 (2<sup>nd</sup> round):</p> <ol style="list-style-type: none"> <li>1. OK. Applicability criterion 1 is revised to also include the relevant procedural description for Greenfield projects. The same also referred to the procedure for the identification of the most plausible baseline scenario provided in section E.4, and overall the revision is deemed sufficient for confirming the CPAs' baseline scenario in accordance with Scenario 1 of ACM0014.</li> <li>2. OK. The applicability criterion #11 is found revised to avoid ambiguity. Now, it is described transparently that the flare is supplied with a gas stream originating from the decomposition of organic material, and overall, the revision is assessed as sufficient for confirming the applicability of CPAs according to the Tool to determine project emissions from flaring gases containing methane. PoA-CAR 17 is closed.</li> </ol>	OK
PoA-CAR 18 (09/02/2012)	30/03/2012 (1 <sup>st</sup> round):	07/05/2012 (1 <sup>st</sup> round):	OK

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<p>Section E.3 of the published PoA-DD does not include the spatial boundary of a typical CPA.</p>	<p>Section E.3 of the published PoA-DD includes the spatial boundary of a typical CPA.</p>	<p>OK. Section E. 3 of the submitted revised PoA-DD now includes the description on the spatial boundary of a typical CPA. It is assessed and found inline with requirements of the applied methodology. POA-CAR 18 is closed.</p>	
<p><b>PoA-CAR 19 (09/02/2012)</b> The published PoA-DD does not describe provisions in case that a CPA implementation might lead to GHG emissions within the project boundary which are expected to contribute more than 1% of the overall expected average annual emission reductions, which are not addressed by the methodology.</p>	<p>30/03/2012 (1<sup>st</sup> round): The PoA-DD has been updated to describe provisions in case that a CPA implementation might lead to GHG emissions within the project boundary which are expected to contribute more than 1% of the overall expected average annual emission reductions, which are not addressed by the methodology.</p>	<p>07/05/2012 (1<sup>st</sup> round): OK. Section E.2 of the PoA-DD is found updated. Provisions have been transparently stated in the revised PoA-DD regarding the case of CPA implementation leading to GHG emissions within the project boundary which are expected to contribute by more than 1% of the overall expected average annual emission reductions, which are not addressed by the methodology. PoA-CAR 19 is closed.</p>	OK
<p><b>PoA-CAR 20 (09/02/2012)</b> In Section E.5.1 of the published PoA-DD, the PP has identified a summary of the steps used to demonstrate the additionality for a typical CPA following the additionality tool. However, the described approaches are ambiguous, and justification is missing on their appropriateness for all the CPAs to be included in the PoA. Moreover, the criteria developed for assessment of additionality in Section E.5.2 just refer to parameters and data sources to be used in the investment</p>	<p>30/03/2012 (1<sup>st</sup> round): In Section E.5.1 of the published PoA-DD, the summary of the steps used to demonstrate the additionality for a typical CPA have been revised to remove ambiguity, and to ensure appropriateness for all the CPAs to be included in the PoA. Moreover, the criteria developed for assessment of additionality in Section E.5.2 have been revised to ensure that they are comprehensive and completely verifiable.</p>	<p>07/05/2012 (1<sup>st</sup> round): OK. Section E.5.1 of the PoA-DD is found revised to improve on clarity and the newly stated procedures for assessment and demonstration of additionality have been assessed as appropriate and in compliance relevant requirements for PoAs that consist of one or more large scale projects as CPAs. Section E.5.2 of the revised PoA-DD has also assessed as to have provided a transparent, sufficient, and verifiable description of the key criteria</p>	OK

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analysis, which are deemed neither comprehensive nor completely verifiable.		for assessing the additionality of a CPA. PoA-CAR 20 is closed.	
<b>PoA-CAR 21 (09/02/2012)</b> Provisions regarding the methodological choice/equation for the calculation of COD lost through sedimentation in the lagoon or sludge pit, grid emission factor, methane emissions from flaring, electricity consumption, fossil fuel consumption, and leakage emissions are not provided in section E.6 of the PoA-DD.	30/03/2012 (1 <sup>st</sup> round): Provisions regarding the methodological choice/equation for the calculation of COD lost through sedimentation in the lagoon or sludge pit, grid emission factor, methane emissions from flaring, electricity consumption, fossil fuel consumption, and leakage emissions have been provided in section E.6 of the PoA-DD.	07/05/2012 (1 <sup>st</sup> round): Not OK. Generally, submitted revised PoA-DD includes the provisions regarding the methodological choice for the calculations of COD lost through sedimentation in the lagoon or sludge pit, grid emission factor, methane emissions from flaring, electricity consumption, fossil fuel consumption, and leakage emissions. However, it is to be noted that Step 6 of the flaring tool has only been partially described as provisions regarding efficiency of open flares are not stated here. Correction is necessary. PoA-CAR 21 continues.	<del>Not OK</del>
PoA-CAR 21 continued ...	27/05/2012 (2 <sup>nd</sup> round): Step 6 of the flaring tool has been updated to include provision for open flares	15/06/2012 (2 <sup>nd</sup> round): OK. Step 6 of the flaring tool is found appropriately updated in section E.6 of the submitted PoA-DD. PoA-CAR 21 is closed.	OK
<b>PoA-CAR 22 (09/02/2012)</b> Parameters to be reported in the CPA-DD form for each individual CPA has not been listed using standard reported parameters template as shown in the PoA-DD form.	30/03/2012 (1 <sup>st</sup> round): Parameters to be reported in the CPA-DD form for each individual CPA have been listed using standard reported parameters template as shown in the PoA-DD form.	07/05/2012 (1 <sup>st</sup> round): OK. The parameters to be reported for each individual CPA has now been listed using standard template as shown in the PoA-DD form. PoA-CAR 22 is closed.	OK

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
<b>PoA-CAR 23 (09/02/2012)</b> Monitoring parameters in Section E.7 of the published PoA-DD have not been presented in standard monitoring template, and the information on some of the monitoring and QA-QC procedures is also not provided. As well, it is not clear whether Annex 4 of the published PoA-DD has intentionally been left blank.	30/03/2012 (1 <sup>st</sup> round): Monitoring parameters in Section E.7 of the published PoA-DD have been presented in standard monitoring template, and the information the monitoring and QA-QC provided. As well, it has been stated that Annex 4 of the published PoA-DD has intentionally been left blank.	07/05/2012 (1 <sup>st</sup> round): OK. Monitoring parameters are now presented in standard table template as per PoA-DD form, including provisions on QA-QC procedures in all the listed parameters. Further, it is now made clear that Annex-4 of the PoA-DD is intentionally left blank. PoA-CAR 23 is closed.	OK.
<b>PoA-CAR 24 (09/02/2012)</b> Not all the relevant monitoring parameters are listed in the published PoA-DD and consistent with the tools applied in the PoA.	30/03/2012 (1 <sup>st</sup> round): All the relevant monitoring parameters are listed in the published PoA-DD and consistent with the tools applied in the PoA.	07/05/2012 (1 <sup>st</sup> round): Not OK. Though improvement has been made, the PP is still required to ensure that all parameters shown in Section E.7 of the PoA-DD are correctly labelled and described as per the applied methodology and tools (e.g. parameters such as EGBL <sub>y</sub> , fvCH <sub>4</sub> , RG, h are inconsistent with the same). Moreover, the header of the table in E.7 is mentioned as D.7.1; this editorial mistake needs to be correct. PoA-CAR 24 continues.	Not OK
<b>PoA-CAR 24 continued ...</b>	27/05/2012 (2 <sup>nd</sup> round): Section E.7 of the PoA-DD has been updated to correctly label EGBL <sub>y</sub> (as per ACM14) and fvCH <sub>4</sub> , RG, h (as per the methane Tool). In addition the header of the table E.7.1 has been corrected."	15/06/2012 (2 <sup>nd</sup> round): OK. Section E.7.1 of the PoA-DD is found revised in line with the applied methodology and the editorial errors are also corrected. PoA-CAR 24 is closed.	OK

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<b>PoA-CL 1 (09/02/2012)</b> The description on the legal obligations of implementing technologies in Section A.4.3 of the published PoA-DD is incomplete, considering that the same has only been described for anaerobic digester system at facilities where wastewater is treated in anaerobic open lagoons, which does not cover the full scope of the PoA. Moreover, Section A.4.3 of the PoA-DD has not provided reference to existing legal requirements in Thailand covering the full scope of the PoA.	<b>30/03/2012 (1<sup>st</sup> round):</b> The description on the legal obligations of implementing technologies in Section A.4.3 of the published PoA-DD has been revised for completeness to cover the full scope of the PoA.	<b>07/05/2012 (1<sup>st</sup> round):</b> OK. Validation team has reviewed the submitted PDD. It was found that reference to the relevant legal obligations of host country is now provided in the submitted revised PoA-DD, covering the full but revised scope of the PoA (i.e. technologies which conform to Scenario 1 in Table 1 of ACM0014). POA-CL 1 is closed.	OK
<b>PoA-CL 2 (09/02/2012)</b> Following deficiencies in the operation and management arrangements for the implementation of the PoA have been identified: <u>Issue 1</u> Based on Section A.4.4.1 of the published PoA-DD, it is not clear how the operational and management plan will be sufficient in ensuring that the CME will have control of all records and information related to the implementation of individual CPAs and will be in a position to ensure each CPA is being operated in accordance with specific requirements of the PoA.  <u>Issue 2</u> A clear definition of roles and responsibilities of	<b>30/03/2012 (1<sup>st</sup> round):</b>  <u>Issue 1</u> Section A.4.4.1 of the published PoA-DD has been updated to provide more details on the operational and management plan to demonstrate that it will be sufficient in ensuring that the CME will have control of all records and information related to the implementation of individual CPAs and will be in a position to ensure each CPA is being operated in accordance with specific requirements of the PoA.	<b>07/05/2012 (1<sup>st</sup> round):</b>  <u>Issue 1</u> Not OK. Section A.4.4.1 of the revised PoA-DD now describes the operational and management plan and the major role taken by the CME to capture the required information and its recording and archiving. However, while requested during the site visit, TBEC's internal operational and management procedures still have not been submitted to DOE.	<del>Not OK</del>

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
<p>personnel involved in the process of inclusion of CPAs, including a review of their competencies has not been made available to the DOE.</p> <p><u>Issue 3</u> Records of arrangements for training and capacity development for personnel have not been made available to the DOE.</p> <p><u>Issue 4</u> Procedures for technical review of inclusion of CPAs have not been made available to the DOE.</p> <p><u>Issue 5</u> Measures for continual improvement of PoA management system have not been made available to DOE.</p> <p><u>Issue 6</u> Proofs and/or agreements that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA have not been made available to the DOE.</p> <p><u>Issue 7</u> Further clarification along with substantiating evidence is requested regarding procedures identified for data</p>	<p><u>Issue 2</u> A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies is under development.</p> <p><u>Issue 3</u> Records of arrangements for training and capacity development for personnel are under development.</p> <p><u>Issue 4</u> Procedures for technical review of inclusion of CPAs are under development.</p> <p><u>Issue 5</u> Measures for continual improvement of PoA management systems are under development.</p> <p><u>Issue 6</u> Proofs and/or agreements that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA are under development.</p>	<p>Issue 2 Not OK. Documents to substantiate the same are pending.</p> <p>Issue 3 : Not OK. Documents to substantiate the same are pending.</p> <p>Issue 4 : Not OK. Documents to substantiate the same are pending.</p> <p>Issue 5 : Not OK. Documents to substantiate the same are pending.</p> <p>Issue 6 : Not OK. Documents to substantiate the same are pending.</p> <p>Issue 7 Not OK. Although data management procedures</p>	

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
management (including data collection, data transfer, and data archive).	<u>Issue 7</u> Further clarification is provided regarding procedures identified for data management (including data collection, data transfer, and data archive).	were found described in the submitted revised PoA-DD, documents to substantiate the same are pending. PoA-CL 2 continues.	
PoA-CL2 continued ...	27/05/2012 (2 <sup>nd</sup> round): Issue 1 TBEC's Inclusion Management System has been submitted which described the operational and management procedures.  Issue 2 TBEC's CPA inclusion management system is provided which contains roles and responsibilities of personnel involved in the process of inclusion of CPAs, including procedures to review their competencies.  Issue 3 : TBEC's CPA inclusion management system is provided which records the process for training and capacity development for personnel.	15/06/2012 (2 <sup>nd</sup> round): Issue 1-7 OK. The validation team has received from the CME TBEC CPA Inclusion Management System (version 1.0, May 2012), with provisions to address all issues raised in PoA-CL2. Based on review of this management system (CPA-IMS), the validation team can confirm the followings: 1. The submitted TBEC's internal operational and management procedures have been assessed by the validation team as appropriately addressed based on the below detailed assessments from point 2 to 7. 2. The overall responsibility for the application, management and improvement of the CPA-IMS is QESH & CDM Department Manager, who has been assessed as having sound technical background and relevant CDM experience for such role. The same may delegate responsibility to other in-house or outsourced staff who, through relevant trainings and satisfactory performance reviews, have completed	OK

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
	<p>Issue 4 : TBEC's CPA inclusion management system is provided which contains procedures for technical review of inclusion of CPAs.</p> <p>Issue 5 : TBEC's CPA inclusion management system is provided which contains measures for continual improvement of PoA management system.</p> <p>Issue 6 : TBEC's CPA inclusion management system is provided which contains templates for proofs and/or agreements that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA.</p>	<p>and able to keep current documents: 1.2 <i>Personal Training and Capacity Development Register</i>, and 1.3 <i>Personal Review and Development Plan</i> prior to commencement of work on the CPA-IMS.</p> <p>3. The arrangements of this training and capacity development prior to the commencing implementation of the CPA-IMS as well as annual review of competencies of the staff must be completed by QESH &amp; CDM Department Manager and further approved by the Line Manager. Records of the same will be kept as per the documents mentioned above.</p> <p>4. The submitted CPA-IMS also contains procedures for technical review of inclusion of CPAs, describing detailed process and sub process steps, and the required documents to ensure that all CPAs to be included meet the relevant requirements described in the PoA-DD.</p> <p>5. The validation team also found that monitoring and measurement activities and corrective actions processes are in place in order to assure continual improvement of the CPA-IMS.</p> <p>6. Further, the CPA-IMS also contains templates for proofs and/or agreements that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA, which have been</p>	

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
	<p>Issue 7</p> <p>TBEC's CPA inclusion management system is provided to provide clarification and substantiating evidence regarding procedures identified for data management (including data collection, data transfer, and data archive).</p>	<p>assessed as sufficient for ensuring the same.</p> <p>7. The CPA-IMS record keeping and document processes are based on standards for quality management systems (e.g. ISO 90001). Control procedures for the defined relevant documents include collection process, ownership rights, approval processes, document identification, storage, retrieval and disposal processes.</p> <p>In all, GLC concludes that the management structure in place is sufficient to ensure that the CME will have control of all records and information related to the implementation of individual CPAs and will be in a position to ensure that each CPA is being operated in accordance to the specific requirements of the PoA. All the issues raised here (Issue 1-7) have been assessed as having been duly and sufficiently addressed.</p> <p>PoA-CL 2 is closed.</p>	
<p>PoA-CL 3 (09/02/2012)</p> <p>Following deficiencies regarding the applicability conditions of ACM0014 have been identified:</p> <p><u>Issue 1</u></p> <p>It is not clear as to how it can be confirmed as to whether the CPA will fall in either Scenario 1 or Scenario 2 described in Table 1 of the applied methodology.</p>	<p>30/03/2012 (1<sup>st</sup> round):</p> <p><u>Issue 1</u></p> <p>It has been clarified how it can be confirmed that the CPA will fall in either Scenario 1 in Table 1 of the applied methodology.</p>	<p>07/05/2012 (1<sup>st</sup> round):</p> <p>Issue 1</p> <p>Not OK. The PoA-DD has been revised as to provide clarity on how it will be confirmed whether the CPA will comply with Scenario 1 as described in Table 1 of the applied methodology ACM0014. However, although it has been indicated that Scenario 2 of the</p>	<p>Not OK</p>

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<p><u>Issue 2</u> It is not clear as to how it can be confirmed that the average depth of the open lagoons or sludge pits in the baseline scenario will be at least 1 meter.</p> <p><u>Issue 3</u> In the published PoA-DD, it is mentioned that a typical CPA will not alter existing wastewater treatment facilities but instead install a new biogas system, which as such, the heat and electricity requirements of the existing system will remain largely unchanged. First of all, this statement requires justification as such provision seems not sufficient to ensure that energy requirements remain largely unchanged in the baseline and project scenario, especially for each and every CPAs. Second, it is to be noted that the PoA is also stated as being intended to be applicable to CPAs that entail treatment of sludge under clearly aerobic conditions; hence in such case, the PP's statement concerning justification of this applicability criterion is not valid.</p> <p><u>Issue 4</u> It is not clear how data requirements as laid out in ACM0014 will be fulfilled by each CPA.</p> <p><u>Issue 5</u> It is not clear how the applicability condition that residence time of the organic matter in the open lagoon</p>	<p><u>Issue 2</u> It has been clarified how it can be confirmed that the average depth of the open lagoons or sludge pits in the baseline scenario will be at least 1 meter.</p> <p><u>Issue 3</u> In the published PoA-DD, the statement regarding the heat and electricity requirements of the existing system will remain largely unchanged has been clarified. The PoA has been updated to clarify that it is not applicable to CPAs that entail Scenario 2 and that both the following are valid: (a) the subsequent processing of treated wastewater under clearly aerobic conditions and (b) the treatment of sludge from the digester under clearly aerobic conditions.</p> <p><u>Issue 4</u> It has been clarified how data requirements as laid out in ACM0014 will be fulfilled by each CPA.</p>	<p>methodology will be removed from the scope of this PoA, references to Scenario 2 are still found in section E.3 and E.6.3 of the PoA-DD. This inconsistency needs to be addressed.</p> <p>Issue 2 OK. It is found that a transparent description is provided in section E.2 of the revised PoA-DD on how the average depth of the open lagoons in the baseline scenario will be assessed.</p> <p>Issue 3 Not OK. The statement regarding the heat and electricity requirements of the existing system will remain unchanged is clarified in the revised PoA-DD. Though the non-applicability of scenario 2 is stated for the project in section E.2, section E.3 and E.6.3 of the PoA-DD still refers to scenario 2 in the provided PoA-DD. PP is required to address this issue. Also, it is not clear what the PP means by stating that: "both the following are valid: (a) the subsequent processing of treated wastewater under clearly aerobic conditions and (b) the treatment of sludge from the digester under clearly aerobic conditions". Further clarification is requested.</p> <p>Issue 4 OK. Explanation on how data requirements as laid</p>	

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<p>system should be at least 30 days can be confirmed as to ensure compliance to each CPA.</p> <p><u>Issue 6</u> As per the published PoA-DD, it is mentioned that a typical CPA will only include solid materials if the relevant applicability conditions laid out in ACM0014 are met, which will be ensured through the design of CPA technology and operating procedure. However, sample design and operating procedure as well as technical review procedure of CPA inclusion have not been submitted to the DOE during the site visit assessment for substantiating the same.</p> <p><u>Issue 7</u> It is not clear how the applicability condition that the sludge produced during the implementation of the project activity is not stored onsite before land application to avoid any possible methane emissions from anaerobic degradation can be confirmed as to ensure compliance to each CPA.</p>	<p><u>Issue 5</u> It has been clarified how the applicability condition that residence time of the organic matter in the open lagoon system should be at least 30 days can be confirmed.</p> <p><u>Issue 6</u> The sample design and operating procedure as well as technical review procedure of CPA inclusion are under development.</p> <p><u>Issue 7</u> The applicability condition that the sludge produced during the implementation of the project activity is not stored onsite before land application to avoid any possible methane emissions from anaerobic degradation has been clarified to demonstrate how compliance of each CPA can be confirmed.</p>	<p>out in ACM0014 will be fulfilled has been adequately described in the revised PoA-DD.</p> <p><u>Issue 5</u> OK. Validation team has reviewed the submitted PoA-DD and found that the applicability condition on the residence time of the organic matter is adequately described for both existing and green field projects in line with the applied methodology.</p> <p><u>Issue 6</u> Not OK. The finding is not yet addressed completely.</p> <p><u>Issue 7</u> Not OK. Contrary to the response provided, provision regarding produced sludge is not stated in the revised PoA-DD. In addition, this applicability condition is related to Scenario 2 of ACM0014, which has been indicated in the revised PoA-DD as no longer to be included in the scope of this PoA. Such inconsistency needs to be addressed.</p> <p>PoA-CL 3 continues.</p>	
<p>PoA-CL 3 continued ...</p>	<p>27/05/2012 (2<sup>nd</sup> round):</p> <p><u>Issue 1</u> Scenario 2 of the methodology has been removed from the scope of this PoA including</p>	<p>15/06/2012 (2<sup>nd</sup> round):</p> <p><u>Issue 1</u> OK. Scenario 2 is found removed all over the PoA-DD. The same is assessed as being consistent with</p>	<p>OK</p>

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	<p>references to Scenario 2 in section E.3 and E.6.3 of the PoA-DD.</p> <p>Issue 3</p> <p>The PoA-DD has been revised to remove references to scenario 2. The criteria has been updated as follows:</p> <p>A typical CPA will not alter existing wastewater treatment facilities but instead install a new biogas system as described in criteria #1 above. The baseline scenario is the use of open lagoons that have clearly anaerobic conditions. As such, the heat and electricity requirements of the existing system (open anaerobic lagoons) will remain largely unchanged because such systems typically utilize small amounts of electricity for pumps. Equipment installed under the project scenario which is required for the capture, treatment and utilization of biogas is not part of the water treatment process. Electricity requirements of the existing wastewater facility will be determined from design drawings (if available) or alternatively from the specifications of the existing equipment (i.e. pumps). Electricity requirements of the wastewater</p>	<p>the defined scope of the PoA.</p> <p>Issue 3</p> <p>OK. Reference to Scenario 2 of ACM0014 has been removed. The revised description has been assessed as reasonable and appropriate for determining the CPA's compliance to the applicability condition.</p> <p>The provided clarification also adequately describes the possible post-treatment system of wastewater and sludge, which will be done aerobically. The same is assessed as reasonable and provided sufficient clarity on the earlier ambiguous statement.</p>	

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	<p>treatment system installed as part of the project activity will be determined from process design drawing and equipment specifications. From these documents it will be determined that the heat and electricity requirements per unit input of the water treatment facility remain largely unchanged.</p> <p>Also, regarding the statement: “both the following are valid: (a) the subsequent processing of treated wastewater under clearly aerobic conditions and (b) the treatment of sludge from the digester under clearly aerobic conditions”. It is clarified that the project activity may install treatment systems at the outlet of digester to process the digester wastewater effluent and settled sludge from the digester. These post treatment systems may employ technology which includes (a) the subsequent processing of treated wastewater from the digester under clearly aerobic conditions and (b) the treatment of settled sludge from the digester under clearly aerobic conditions. In general practice however, the effluent from the digester will be directed to the existing baseline open lagoons and any sludge settling in the digester will be re-</p>		

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	<p>circulated within the digester.</p> <p><u>Issue 6</u></p> <p>The CPA-DD Development Sub-Process of the TBEC CPA inclusion management system includes a Review of the CPA-DD to ensure compliance and quality. The review includes an eligibility criteria check.</p> <p>The applicability condition was updated as follows:  A typical CPA will only include solid materials where: (i) Such solid materials are generated by the industrial facility producing the wastewater, and (ii) The solid materials would be generated both in the project and in the baseline scenario.</p> <p>The design of the CPA project activity (substantiated from the technology process flow diagram) will be utilised to demonstrate whether solid materials are included in the process design. Any solid materials indicated for use in the process flow diagram will be confirmed to be:  (i) Generated by the industrial facility producing the wastewater through onsite observation of the process equipment and photographic evidence,</p>	<p><u>Issue 6</u></p> <p>OK. The revised response has been assessed as reasonable and appropriate for determining the CPA's compliance to the applicability condition. Based on the review of the document TBEC CPA inclusion management system (including technical review procedure), validation team assesses that the same is sufficient to ensure compliance with this applicability condition.</p>	

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	<p>(ii) The solid materials would be generated both in the project and in the baseline scenario through review of both the project process design and the existing facility design. Data described above will be recorded in the CPA-DD. Original design documents will be retained in the CME filing system in soft copy format in an electronic filing system managed by the CME.</p> <p><u>Issue 7</u> The applicability condition relating to sludge produced during the implementation of Scenario 2 has been removed from the PoA-DD.</p>	<p>Issue 7 OK. The applicability condition related to the sludge production during the implementation of scenario 2 is found removed. The same is assessed as appropriate and in compliance with the defined scope of the PoA. PoA-CL3 is closed.</p>	
<p>PoA-CL 4 (09/02/2012) Following deficiencies regarding the approach adopted for the determination of baseline scenario as demonstrated in the published PoA-DD have been identified: <u>Issue 1</u> The published PoA-DD has eliminated scenario W3 (aerobic wastewater treatment facilities) as a plausible scenario. Justification is deemed insufficient as although there are no revenues or cost savings to be gained, it may still be a plausible scenario. Moreover, this contradicts with the fact that alternative W3 is the</p>	<p>30/03/2012 (1<sup>st</sup> round):</p> <p><u>Issue 1</u> The eliminated of scenario W3 (aerobic wastewater treatment facilities) as a plausible scenario has been justified. Scenario 2 has been removed.</p>	<p>07/05/2012 (1<sup>st</sup> round):</p> <p>Issue 1 Not OK. The description to exclude the scenario is provided in the submitted PoA-DD. However, the cited references are not made available to the validation team for assessment.</p>	<p>Not OK</p>

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<b>Description of Finding</b> <b>(CAR, CL, FAR)</b> <i>Describe the finding in a transparent manner i.e. state clearly what required and why; address the context (e.g. section)</i>	<b>Project Participants Response</b> <i>This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence</i>	<b>GLC Assessment</b> <i>The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.</i>	<b>Final Concl.</b> <b>(OK or not OK)</b>
<p>only possible option for treatment of wastewater under Scenario 2 in Table 1 of the applied methodology, which has been described in the published PoA as a possible technological choice to be implemented in the CPA.</p> <p><u>Issue 2</u> The published PoA-DD has eliminated scenario W4 (anaerobic digester with methane recovery and flaring) on ground that there are no revenues or cost savings. However, this contradicts with the description provided regarding technology to be employed by the CPA as well as the eligibility criteria shown in the published PoA-DD.</p> <p><u>Issue 3</u> In the published PoA-DD, it is mentioned that under Thai regulations, it is illegal to directly discharge wastewater into water bodies. However, it is not clear why this regulation has been used for the elimination of alternatives W6 (wastewater is directed to land application without dewatering and W7 (wastewater is dewatered and directed to land application/used as fuel in energy applications). Moreover, discussion regarding host country policy and incentive for water pollution control and renewable energy use are not clarified in</p>	<p><u>Issue 2</u> The elimination of scenario W4 (anaerobic digester with methane recovery and flaring) has been clarified.</p> <p><u>Issue 3</u> The elimination of alternatives W6 (wastewater is directed to land application without dewatering and W7 (wastewater is dewatered and directed to land application/used as fuel in energy applications) has been clarified. Moreover, discussion regarding host country policy and incentive for water pollution control and renewable energy are clarified in the PoA-DD.</p>	<p><u>Issue 2</u> OK. The inconsistency has been corrected and Section E.4 of the revised PoA-DD now clarifies that scenario W4 (anaerobic digester with methane recovery and flaring) although remains a plausible alternative for the PoA, it may be eliminated in the CPA-specific context depending on details of each CPA site, which will be justified in the CPA-DD.</p> <p><u>Issue 3</u> OK. A transparent description is provided for the ruling out alternatives W6 and W7 in the submitted revised PoA-DD. Validation team has reviewed the provided the description and found it is correct.</p>	

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<p>the PoA-DD.</p> <p><u>Issue 4</u> Step 3 of the latest version of the additionality tool has not been properly applied as per the required procedure for identification of the most plausible baseline scenario. Moreover, justification as to whether the listed barriers are valid in accordance with EB50 Annex 13 is not provided.</p> <p><u>Issue 5</u> The additional background information on baseline data has not been provided in PoA-DD Annex 3 if any.</p>	<p><u>Issue 4</u> Step 3 of the latest version of the additionality tool has not been properly applied.</p> <p><u>Issue 5</u> Annex 3 has been updated as necessary.</p>	<p>Issue 4 Not OK. The provided response is not addressing the finding.</p> <p>Issue 5 : OK. Annex -3 of the PoA-DD has been revised and stated as intentionally left blank.</p> <p>PoA-CL 4 continues.</p>	
<p>PoA-CL 4 continued ...</p>	<p>27/05/2012 (2<sup>nd</sup> round):</p> <p><u>Issue 1</u> The relevant pages of the reference documents for 'Advanced biological treatment processes for industrial wastewaters' and 'Water Quality Control Handbook 2007' are provided with this Findings Response.</p> <p><u>Issue 4</u> Step 3 of the latest version of the additionality</p>	<p>15/06/2012 (2<sup>nd</sup> round):</p> <p>Issue 1 OK. It is firstly noted that Scenario 2 in Table 1 of ACM0014 has been removed from the scope of this PoA. The PP has argued that Alternative W3 - Aerobic wastewater treatment facilities may be eliminated due to technological barrier, as the process/technology risk of aerobic treatment is significantly higher than for the comparable common practice treating wastewater open anaerobic lagoons. The same has been substantiated by relevant scientific literature, submitted along with this</p>	<p>OK</p>

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	<p>tool has been properly applied (in the context of the ACM0014 procedure for identification of the most plausible baseline). Reference to EB50 Annex 13 is provided.</p>	<p>response, that indicates the COD of high strength industrial organic rich wastewater is far too high to treat in aerobic process (see E. Roberts Alley, 'Water Quality Control Handbook 2007', page 10.65). The elimination of W3 scenario was further argued on ground that aerobic treatment systems are more complicated due to inherent difficulties like oxygen transfer problem, high waste sludge produces and settling problem (see Francisco J. Cervantes et al., 'Advanced biological treatment processes for industrial wastewaters, Principles and Applications', page 259). It is assessed that the stated barrier is credible and in line with our local knowledge that aerobic treatment plant is not common in Thailand (which is the scope of the PoA) for primary treatment of high COD industrial wastewater, and if adopted, would normally used as secondary treatment system (e.g. after the wastewater is treated in open anaerobic lagoons). Since this barrier is inherent to the nature of the high strength industrial organic rich wastewater, it is deemed as reasonable for the elimination of W3 scenario in that its failure risk in the local and PoA-specific circumstances is significantly greater than for other technologies for treatment of industrial wastewater (e.g. open anaerobic lagoons). It is further noted that the use of the above-cited</p>	

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		<p>references is also in compliance with that required by the additionality tool (i.e. relevant scientific literature or technology manufacturer information) and deemed to be of reputed sources, which can be used as evidence of the presence of the barrier for other project(s) under similar circumstances. Hence, the same has been deemed as representing objective demonstration of barrier in accordance with EB50 Annex 13. In conclusion, it is the opinion of the validation team that the elimination of Alternative W3 - Aerobic wastewater treatment facilities as plausible alternative in the PoA is reasonable and can be accepted.</p> <p>Issue 4 : OK. Response is revised to reflect the actual changes made to the PoA-DD. Step 3 of the latest version of the additionality tool is assessed as having been properly applied, and will be applicable for all CPAs in the determination of baseline scenario. Moreover, it is deemed that sufficient justification is provided to support the validity of the listed barriers in accordance with EB50 Annex 13.</p> <p>PoA-CL 4 is closed.</p>	
PoA-CL 5 (09/02/2012)	30/03/2012 (1 <sup>st</sup> round):	07/05/2012 (1 <sup>st</sup> round):	Not OK

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<p>Following deficiencies regarding the appropriateness of approaches, parameters and data sources specified in the published PoA-DD as to be used in the investment analysis at CPA level have been identified:</p> <p><u>Issue 1</u> It is not clear what are considered as similar plants/project structure, where the technology efficiency, conversion factor or historical records of which will be used as the basis for calculating (a) yearly methane production, (b) yearly electricity production, (c) percentage of biogas flared.</p> <p><u>Issue 2</u> It is not clear how the use of bi-lateral agreement such as BOOT contract used to determine (a) biogas sale/income price, (b) electricity tariff, (c) escalation tariff, and (d) residual value of equipment could allow a non-subjective assessment as to whether a reasonable investor would decide to proceed with a particular project activity without the benefits of the CDM. The PP is requested to clarify the same, including a justification as to how the concerns expressed by the Meth Panel (see CLA_TOOL_0012) regarding the disadvantages of the BOOT contract can be addressed in the context of the PoA.</p> <p><u>Issue 3</u> Justification is necessary as to why national CPI</p>	<p><u>Issue 1</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p> <p><u>Issue 2</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p> <p><u>Issue 3</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p> <p><u>Issue 4</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p>	<p>Issue 1 to Issue 11</p> <p>OK. Section E.5 of the revised PoA-DD has been overhauled as to now indicate that the assessment and demonstration of additionality will be done by applying the "Tool for the demonstration and assessment of additionality", version 6.0, at each CPA level and each CPA will separately provide an explanation of how the tool has been applied in the context of the specific CPA, taking into account relevant CDM guidelines such as: "Guidelines on the assessment of investment analysis" Version 5.0.0., and "Guidelines for objective demonstration and assessment of barriers", Version 1.0. The revised approach has been assessed as reasonable and in compliance with relevant requirements for PoAs that consist of one or more large scale projects as CPAs.</p>	

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<p>figures can be considered as appropriate source of escalation rate for electricity tariff. As well, whether it is appropriate to assume the same as basis for escalation rate of O&amp;M cost.</p> <p><u>Issue 4</u> It is not clear whether the application of zero salvage value could be regarded as the reasonable expectation of the potential profit or loss on the realisation of the assets.</p> <p><u>Issue 5</u> Justification is required as to how EPC contract and service agreement could be considered as appropriate source of total investment cost and O&amp;M cost respectively, taking into consideration para 6 of EB 62 Annex 5.</p> <p><u>Issue 6</u> Justification is required as to how TBEC accounting records for O&amp;M costs could be considered as appropriate data source for total O&amp;M cost for all CPAs.</p> <p><u>Issue 7</u> The stated financial parameters shown in Section E.5 are deemed incomplete and not sufficient for assessing additionality through investment analysis for all types CPAs described in Section A.2 of the published PoA-DD.</p>	<p><u>Issue 5</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p> <p><u>Issue 6</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p> <p><u>Issue 7</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p> <p><u>Issue 8</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p> <p><u>Issue 9</u></p>		

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<p><u>Issue 8</u> It is not justified whether and why the selected benchmark analysis method is appropriately chosen for all CPAs to be included in the PoA.</p> <p><u>Issue 9</u> In section E.5 of the published PoA-DD, it is not clear whether pre-tax or post-tax IRR will be calculated to demonstrate additionality of a typical CPA. Moreover, the provisions in the published PoA-DD do not ensure that IRR calculation and benchmark selection properly and consistently takes into account the effect of tax as applicable.</p> <p><u>Issue 10</u> In Section E.5 of the published PoA-DD, it is not clear whether cost of financing expenditures will be excluded in the case that project IRR is calculated.</p> <p><u>Issue 11</u> In Section E.5 of the published PoA-DD, it is not clear whether in the case of equity IRR is calculated, the parts of the investment costs financed by equity will be considered as net cash outflow, as well as whether the part financed by debt will be excluded in net cash outflow.</p> <p><u>Issue 12</u> Section E.5.1 of the published PoA-DD stated that cost of equity/benchmark for equity IRR will be Return on</p>	<p>The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p> <p><u>Issue 10</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p> <p><u>Issue 11</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p> <p><u>Issue 12</u> The approaches, parameters, and data sources have been revised to directly reference the relevant CDM methodologies, tools and guidelines.</p>	<p>Issue 12: Not OK. The revised PoA-DD suggests that a typical benchmark to be applied for IRR calculation is the Weighted Average Cost of Capital (WACC) based on commercial lending rates from public sources as cost of debt, while cost of equity will be based on Return on Equity (ROE) based on "Energy and Utilities" category of the Stock Exchange of Thailand. The same is assessed as not sufficient and further explanation is needed as to how the described typical</p>	

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<p>Equity (ROE) that is published by national stock market for companies that face a similar risk profile to the CPA. However, it is not clear whether this is an appropriate source for cost of equity that has been calculated using best financial practices.</p>		<p>benchmark is appropriate for all CPAs to be included in the PoA. Please refer to para 12-18 of EB62 Annex 5.</p> <p>PoA-CL 5 continues.</p>	
<p>PoA-CL 5 continued ...</p>	<p>27/05/2012 (2<sup>nd</sup> round): Issue 12:</p> <p>The revised PoA-DD suggests that a typical benchmark to be applied for IRR calculation is the Weighted Average Cost of Capital (WACC) based on commercial lending rates from public sources as cost of debt, while cost of equity will be based on Return on Equity (ROE) based on "Energy and Utilities" category of the Stock Exchange of Thailand. The guidelines in paragraph 12-18 of EB62 Annex 5 are applied as follows.</p> <p>In accordance with guidance 12: In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. Required/expected returns on equity are</p>	<p>15/06/2012 (2<sup>nd</sup> round): Issue 12 Not yet OK.</p> <p>First, it is noted that as per para 13 of EB62 Annex 5, "the applied benchmark must be suitable for the specific proposed project activity. It is not suitable to compare the return of low risk investments with the returns achieved or achievable by higher risk investments".</p> <p>Second, the validation team has referred to EB51 Annex 59 for guidance, which stated:</p> <p>Para 9: "for projects in which electricity was being produced for captive consumption the benchmark of the core business was considered to be appropriate, as the project was considered to be an investment in the operation of the core business", and</p> <p>Para 10: "for projects in which the electricity was</p>	<p>Not OK</p>

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	<p>appropriate benchmarks for equity IRR. Benchmarks supplied by relevant national authorities are also appropriate if it can be validated that they are applicable to the project activity and the type of IRR calculation presented. As such, WACC is deemed an appropriate benchmark for project IRR.</p> <p>In accordance with guidance 13: In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on parameters that are standard in the market. Commercial lending rates from public sources and Return on Equity (ROE) based on "Energy and Utilities" category of the Stock Exchange of Thailand are parameters which are standard in the market.</p> <p>Guidance 14 is only relevant to cases where there can only be one possible project developer; hence this guideline is not relevant.</p> <p>In accordance with guidance 15: If the benchmark is based on parameters that are standard in the market, the cost of equity should</p>	<p>being exported to the grid the benchmark of the core business was not considered to be appropriate, as the project was considered to be an investment in power production and therefore to face a risk profile different to that of the core business of the project developer."</p> <p>Although the guidance was made in relation to waste heat/gas fuelled electricity generation projects, it is the opinion of the validation team that its essence is, risk profile applied for benchmark determination should be chosen in accordance with the purpose of utilizing Project's energy output.</p> <p>Third, it is further noted project activities include in this PoA may include one or more of the following methane combustion/utilization measures:</p> <ul style="list-style-type: none"> <li>a. Destruction of recovered methane in a burner to produce useful heat energy</li> <li>b. Destruction of recovered methane in power generation equipment to produce renewable electricity</li> <li>c. Destruction of recovered methane in a flare.</li> </ul> <p>Since such scope of the PoA means that CPA</p>	

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	<p>be determined either by: (a) selecting the values provided in Appendix A; or by (b) calculating the cost of equity using best financial practices, based on data sources which can be clearly validated by the DOE, while properly justifying all underlying factors. The Return of Equity will be calculated based on parameters which are standard in the market and which were available at the time of the investment decision. In the absence of specific benchmarks published by relevant national authorities for biogas projects in Thailand, the Return on Equity of "Energy and Utilities" category of the Stock Exchange of Thailand (SET) is publicly available. Information on equity returns for energy companies not listed on SET listed is not available as these companies are not required to make this information public. In addition, it is possible to identify within this category financial information relating to specific companies involved in the production of energy over the three years prior to the decision to invest in the CPA.</p> <p>Guidance 16 is only relevant to cases where the company's internal benchmark is used; hence this guideline is not relevant.</p>	<p>measures may involve just captive heat/power generation in, for example, food processing plants, or may not involve any energy generation at all (in case only flaring measure is implemented), it is assessed as not fully appropriate to compare the return of these investments with the returns achieved or achievable by another industry e.g. power generation sector.</p> <p>Hence, given the above background, the validation team remains not convinced that ROE based on "Energy and Utilities" category of the Stock Exchange of Thailand, could be considered as appropriate equity benchmark / cost of equity for all CPAs to be included in the PoA.</p> <p>PoA-CL 5 continues.</p>	

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	<p>Guidance 17 is only relevant to cases where the company's internal benchmark is used; hence this guideline is not relevant.</p> <p>In accordance with guidance 18: If the benchmark is based on parameters that are standard in the market, then the typical debt/equity finance structure observed in the sector of the country should be used. If such information is not readily available, 50% debt and 50% equity financing may be assumed as a default. The Debt: Equity structure is available for the list of energy companies used to calculate the ROE and hence will be applied.</p>		
PoA-CL 5 continued ...	<p>21/06/2012 (3<sup>rd</sup> round): Issue 12</p> <p>The revised PoA-DD has been updated to remove the ROE based on "Energy and Utilities" category of the Stock Exchange of Thailand as an appropriate equity benchmark / cost of equity for all CPAs to be included in the PoA. Instead, the approach has been revised to directly reference the relevant CDM methodologies, tools and guidelines. The PoA-DD states that the</p>	<p>02/07/2012 (3<sup>rd</sup> round): Issue 12</p> <p>OK. The revised PoA-DD has been updated as to avoid pre-defining a general investment benchmark to be adopted for all CPAs to be included in this PoA. Rather, the benchmark will be defined as applicable individually for each CPA following the "Tool for the demonstration and assessment of additionality", version 6.0 and "Guidelines on the assessment of investment analysis" Version 5.0.0. The revised</p>	OK

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	<p>"Guidelines on the assessment of investment analysis" should be taken into account in the application of step 2 of the Investment Analysis.</p>	<p>approach has been assessed as reasonable and in compliance with relevant requirements for PoAs that consist of one or more large scale projects as CPAs. PoA-CL 5 is closed.</p>	
<p><b>PoA-CL 6 (09/02/2012)</b> Based on Section A and E.1 of the published PoA-DD, the PoA does not cover the case whereby the wastewater in the project scenario of the CPA is dewatered or directed to land application. Moreover, such scenario is stated in Section E.4 of the published PoA-DD as not in compliance with the Thai regulations. However, reference to equation/ methodological choice of the same has still been included in Section E.6.2 of the published PoA-DD, which is deemed inconsistent.</p>	<p>30/03/2012 (1<sup>st</sup> round): The case whereby the wastewater in the project scenario <u>is not treated</u> but instead dewatered or directed to land application is not included in the PoA. This scenario is not in accordance with Thai Regulations; wastewater must first be treated before being applied to lands. References to equation/ methodological choices for application of <u>treated</u> water to land has still been included in Section E.6.2 of the published PoA-DD for the case where treated wastewater from the digester is dewatered and applied to land.</p>	<p>07/05/2012 (1<sup>st</sup> round): OK. The explanation is reasonable and can be accepted, taking into account that Section E.6.2 of the revised PoA-DD also clearly states that the residual from the anaerobic digester would be sent to either open lagoons or treated under clearly aerobic conditions. (dewatering and land application). Moreover, the validation team can confirm that as per Thai regulations direct discharge of wastewater to water bodies is not allowed with or without dewatering to the land application. All the relevant equations to determine the emission are included in section E.6.2 of the provided PoA-DD. PoA-CL 6 is closed.</p>	<p>OK</p>
<p><b>Generic CPA-CAR 1 (13/07/2012)</b> Generic CPA-DD is not fully consistent with the finalised PoA-DD.</p>	<p>16/07/2012 The generic CPA-DD has been made fully consistent with the finalised PoA-DD.</p>	<p>18/07/2012 OK. The revised generic CPA-DD has been checked with the finalised PoA-DD and it is concluded that the same is consistent and appropriate. 17/08/2012 (TR stage) OK. It is noted that further revision of the Generic</p>	<p>OK</p>

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		CPA-DD has been made to address TR comments. The revised generic CPA-DD has been checked with the finalised PoA-DD and it is concluded that the same is consistent and appropriate.	

# Inclusion Report

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## ANNEX B: CERTIFICATES OF COMPETENCE

# Inclusion Report

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## Certificate



Name : Mr. Sithisakdi Apichatthanapath (M.Sc.)  
Certificate No. : 048

This document certifies that Mr. Sithisakdi Apichatthanapath, citizen of Thailand, is assigned as CDM assessment team leader, validator/verifier and expert by Germanischer Lloyd Certification GmbH.

Mr. Sithisakdi Apichatthanapath fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)	Validity date:
<b>SS 1: Energy Industries (renewable / non-renewable sources)</b>	
TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	
TA 1.2: Energy generation from renewable energy sources	2011-09-29
<b>SS 2: Energy Distribution</b>	
TA 2.1: Electricity distribution	
TA 2.2: Heat distribution	
<b>SS 3: Energy Demand</b>	
TA 3.1: Energy demand	
<b>SS 7: Transport</b>	
TA 7.1: Transport	
<b>SS 10: Fugitive Emissions from Fuels</b>	
TA 10.1: Mining and mineral processes (excluding those included in TA 10.2)	
TA 10.2: Oil and gas industry, coal mine methane recovery and use	
<b>SS 13: Waste Handling and Disposal</b>	
TA 13.1: Waste handling and disposal	
TA 13.2: Animal waste management	

Hamburg

2012-03-05

Date

GLC Management

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# Inclusion Report

GLC Report No. 227, Rev. 09



## Certificate



Name : Mr. Srikanth Meesa (M.Tech.)  
Certificate No. : 006

This document certifies that Mr. Srikanth Meesa, citizen of country India, is assigned as CDM assessment team leader and validator/verifier by Germanischer Lloyd Certification GmbH.

Mr. Srikanth Meesa fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)	Validity date:
<b>SS 1: Energy Industries (renewable / non-renewable sources)</b>	
TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	
TA 1.2: Energy generation from renewable energy sources	
<b>SS 2: Energy Distribution</b>	
TA 2.1: Electricity distribution	
TA 2.2: Heat distribution	
<b>SS 3: Energy Demand</b>	
TA 3.1: Energy demand	
<b>SS 7: Transport</b>	
TA 7.1: Transport	
<b>SS 10: Fugitive Emissions from Fuels</b>	
TA 10.1: Mining and mineral processes (excluding those included in TA 10.2)	
TA 10.2: Oil and gas industry, coal mine methane recovery and use	
<b>SS 13: Waste Handling and Disposal</b>	
TA 13.1: Waste handling and disposal	
TA 13.2: Animal waste management	

Hamburg

2011-03-17

Date

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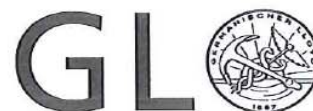
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## GLC Report No. 227, Rev. 09



# Certificate



Name : Mrs Jun Wang  
Certificate No. : 51

This document certifies that Mrs Jun Wang citizen of China with experience in the region China and Germany, is assigned as CDM assessment team leader, validator/verifier and expert by Germanischer Lloyd Certification GmbH.

Mrs Jun Wang fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)	Validity date:
<b>SS 1: Energy Industries (renewable / non-renewable sources)</b>	
TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	
TA 1.2: Energy generation from renewable energy sources	2012-03-09
<b>SS 2: Energy Distribution</b>	
TA 2.1: Electricity distribution	
TA 2.2: Heat distribution	
<b>SS 3: Energy Demand</b>	
TA 3.1: Energy demand	
<b>SS 7: Transport</b>	
TA 7.1: Transport	
<b>SS 10: Fugitive Emissions from Fuels</b>	
TA 10.1: Mining and mineral processes (excluding those included in TA 10.2)	
TA 10.2: Oil and gas industry, coal mine methane recovery and use	
<b>SS 13: Waste Handling and Disposal</b>	
TA 13.1: Waste handling and disposal	
TA 13.2: Animal waste management	

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# Inclusion Report

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## Certificate

Name : Mr. Benedikt Maibaum (Dipl.)

Certificate No. : 044

This document certifies that Mr. Benedikt Maibaum, citizen of Germany, is assigned as expert by Germanischer Lloyd Certification GmbH.

Mr. Benedikt Maibaum fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)	Validity date:
<b>SS 1: Energy Industries (renewable / non-renewable sources)</b>	
TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	2011-08-01
TA 1.2: Energy generation from renewable energy sources	
<b>SS 2: Energy Distribution</b>	
TA 2.1: Electricity distribution	
TA 2.2: Heat distribution	
<b>SS 3: Energy Demand</b>	
TA 3.1: Energy demand	
<b>SS 7: Transport</b>	
TA 7.1: Transport	
<b>SS 10: Fugitive Emissions from Fuels</b>	
TA 10.1: Mining and mineral processes (excluding those included in TA 10.2)	
TA 10.2: Oil and gas industry, coal mine methane recovery and use	
<b>SS 13: Waste Handling and Disposal</b>	
TA 13.1: Waste handling and disposal	2011-08-01
TA 13.2: Animal waste management	

Hamburg

2011-08-12

Date

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# Inclusion Report

GLC Report No. 227, Rev. 09



## Certificate



Name : Mrs. Anu Chaudhary (M.Sc.)

Certificate No. : 010

This document certifies that Mrs. Anu Chaudhary, citizen of India, is assigned as CDM assessment team leader, validator/verifier and expert by Germanischer Lloyd Certification GmbH.

Mrs. Anu Chaudhary fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)	Validity date:
<b>SS 1: Energy Industries (renewable / non-renewable sources)</b>	
TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	
TA 1.2: Energy generation from renewable energy sources	
<b>SS 2: Energy Distribution</b>	
TA 2.1: Electricity distribution	
TA 2.2: Heat distribution	
<b>SS 3: Energy Demand</b>	
TA 3.1: Energy demand	
<b>SS 7: Transport</b>	
TA 7.1: Transport	
<b>SS 10: Fugitive Emissions from Fuels</b>	
TA 10.1: Mining and mineral processes (excluding those included in TA 10.2)	
TA 10.2: Oil and gas industry, coal mine methane recovery and use	
<b>SS 13: Waste Handling and Disposal</b>	
TA 13.1: Waste handling and disposal	2009-09-22
TA 13.2: Animal waste management	

Mrs. Anu Chaudhary fulfils GLC's competence requirements to validate financial analysis of CDM project activities.

Validity date:  
2009-09-23

Hamburg

2011-03-17

Date

  
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# Inclusion Report

GLC Report No. 227, Rev. 09



## Certificate



Name : Mr. José Emilio Moreno (Dipl.-Ing.)  
Certificate No. : 016

This document certifies that Mr. José Emilio Moreno, citizen of Spain, is assigned as CDM assessment team leader, validator/verifier and expert by Germanischer Lloyd Certification GmbH.

Mr. José Emilio Moreno fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)	Validity date:
<b>SS 1: Energy Industries (renewable / non-renewable sources)</b>	
TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	2010-09-25
TA 1.2: Energy generation from renewable energy sources	2010-10-22
<b>SS 2: Energy Distribution</b>	
TA 2.1: Electricity distribution	
TA 2.2: Heat distribution	
<b>SS 3: Energy Demand</b>	
TA 3.1: Energy demand	2011-03-20
<b>SS 7: Transport</b>	
TA 7.1: Transport	
<b>SS 10: Fugitive Emissions from Fuels</b>	
TA 10.1: Mining and mineral processes (excluding those included in TA 10.2)	
TA 10.2: Oil and gas industry, coal mine methane recovery and use	
<b>SS 13: Waste Handling and Disposal</b>	
TA 13.1: Waste handling and disposal	
TA 13.2: Animal waste management	

Hamburg

2011-03-20

Date

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# Inclusion Report

GLC Report No. 227, Rev. 09



## Certificate



Name : Mr. Ruifeng Li (B.Eng.)  
Certificate No. : 008

This document certifies that Mr. Ruifeng Li, citizen of China, is assigned as CDM assessment team leader, validator/verifier and expert by Germanischer Lloyd Certification GmbH.

Mr. Ruifeng Li fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)	Validity date:
<b>SS 1: Energy Industries (renewable / non-renewable sources)</b>	
TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	
TA 1.2: Energy generation from renewable energy sources	2012-05-22
<b>SS 2: Energy Distribution</b>	
TA 2.1: Electricity distribution	
TA 2.2: Heat distribution	
<b>SS 3: Energy Demand</b>	
TA 3.1: Energy demand	
<b>SS 7: Transport</b>	
TA 7.1: Transport	
<b>SS 10: Fugitive Emissions from Fuels</b>	
TA 10.1: Mining and mineral processes (excluding those included in TA 10.2)	
TA 10.2: Oil and gas industry, coal mine methane recovery and use	
<b>SS 13: Waste Handling and Disposal</b>	
TA 13.1: Waste handling and disposal	2009-09-03
TA 13.2: Animal waste management	

Hamburg

2012-05-22

Date

  
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## Certificate



Name : Mr. Markus Weber (Dipl.)  
Certificate No. : 001

This document certifies that Mr. Markus Weber, citizen of Germany, is assigned as CDM assessment team leader, validator/verifier and expert by Germanischer Lloyd Certification GmbH.

Mr. Markus Weber fulfils GLC's competence requirements to validate and verify CDM projects within the following sectoral scopes and technical areas.

CDM Sectoral Scope (SS) and Technical Area (TA)	Validity date:
<b>SS 1: Energy Industries (renewable / non-renewable sources)</b>	
TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar	
TA 1.2: Energy generation from renewable energy sources	2011-09-09
<b>SS 2: Energy Distribution</b>	
TA 2.1: Electricity distribution	
TA 2.2: Heat distribution	
<b>SS 3: Energy Demand</b>	
TA 3.1: Energy demand	
<b>SS 7: Transport</b>	
TA 7.1: Transport	
<b>SS 10: Fugitive Emissions from Fuels</b>	
TA 10.1: Mining and mineral processes (excluding those included in TA 10.2)	
TA 10.2: Oil and gas industry, coal mine methane recovery and use	
<b>SS 13: Waste Handling and Disposal</b>	
TA 13.1: Waste handling and disposal	2008-12-15
TA 13.2: Animal waste management	

Hamburg

2011-09-09

Date

  
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