



VALIDATION REPORT

**SOUTH POLE CARBON ASSET MANAGEMENT
LTD.**

**BANGNA STARCH WASTEWATER TREATMENT
AND BIOGAS UTILIZATION PROJECT**

Report No: 8000353483- 07/168

Date: 10 November 2009

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Client: South Pole Carbon Asset Management Ltd.	Client ref.: Mr. Patrick Bürgi
Summary:	☒ positive validation opinion ☐ negative validation opinion
South Pole Carbon Asset Management Ltd. has commissioned the TÜV NORD JI/CDM Certification Program (CP) to validate the project: "Bangna Starch Wastewater Treatment and Biogas Utilization Project" with regard to the relevant requirements of the UNFCCC for CDM project activities, as well as criteria for consistent project operations, monitoring and reporting. UNFCCC criteria include article 12 of the Kyoto Protocol, the modalities and procedures for CDM (Marrakech Accords) and the relevant decisions by COP/MOP and CDM Executive Board. In the course of the pre-validation 11 CARs Corrective Action Requests (CARs) and 9 CLs Clarification Requests (CLs) were raised and successfully closed. The review of the project design documentation and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and review of comments by parties, stakeholders and NGOs have provided TÜV NORD JI/CDM CP with sufficient evidence to validate the fulfilment of the stated criteria. In detail the conclusions can be summarised as follows: - The project is in line with all relevant host country criteria (Thailand) and all relevant UNFCCC requirements for CDM. Project activity approval have been obtained from DNA of Thailand vide the Letter of Approval (HCA) dated 2008-06-16 from DNA of Switzerland dated 2009-05-25. - The project additionality is sufficiently justified in the PDD. - The monitoring plan is transparent and adequate. - The calculation of the project emission reductions is carried out in a transparent and conservative manner, so that the calculated emission reductions of 291,908 tCO₂e are most likely to be achieved within the (1st renewable) crediting period. The conclusions of this report show, that the project, as it was described in the project documentation, is in line with all criteria applicable for the validation.	

Report No.: 8000353483- 07/168	Subject Group: Climate Protection
Report title: Bangna Starch Wastewater Treatment and Biogas Utilization Project	
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Final technical review by: Martin Saalman	Local technical review by: -
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Indexing terms

Climate protection
Kyoto Protocol
CDM

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Abbreviations

BAU	Business as usual
CA	Corrective Action / Clarification Action
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CL	Clarification Request
CO₂	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
CP	Certification Program
DNA	Designated National Authority
EB	CDM Executive Board
EIA	Environmental Impact Assessment
FAR	Forward Action Request
GHG	Greenhouse gas(es)
HCA	Host Country Approval
IPCC	Intergovernmental Panel on Climate Change
LOA	Letter of Approval
PDD	Project Design Document
QC/QA	Quality control/Quality assurance
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

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1 OBJECTIVE / SCOPE

The purpose of a validation is to have an independent third party assess the project design. In particular the project's baseline, the monitoring plan (MP), and the project's compliance with

- the requirements of Article 12 of the Kyoto Protocol;
- the CDM modalities and procedures as agreed in the Marrakech Accords under decision 3/CMP.1
- the annex to the decision;
- subsequent decisions made by COP/MOP & CDM Executive Board and
- other relevant rules, including the host country legislation and sustainability criteria

are validated in order to confirm that the project design as documented is sound and reasonable and meets the stated requirements and identified criteria. Validation is seen as necessary to provide assurance to stakeholders on the quality of the project and its intended generation of certified emission reductions (CERs).

The validation scope is given as a thorough independent and objective assessment of the project design including especially: the correct application of the methodology, the project's baseline study, additionality justification, local stakeholder commenting process, environmental impacts and monitoring plan, which are included in the PDD and other relevant supporting documents, to ensure that the proposed CDM project activity meets all relevant and applicable CDM criteria.

The information included in the PDD and the supporting documents were reviewed against the requirements as set out by the UNFCCC. The validation team has, based on the requirements in the Validation and Verification Manual^{VVM}, carried out a full assessment of all evidences to assess the compliance of the project with the key areas as outlined in section V.E. and V.F. of the VVM (version 1, EB 44).

The validation is based on the information made available to TÜV NORD JI/CDM CP and on the contract conditions. TÜV NORD JI/CDM CP can not be held liable by any entity for making its validation opinion based on any false or misleading information supplied to it during the course of validation.

The validation is not meant to provide any consulting to the project participants. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

2 GHG PROJECT DESCRIPTION

2.1 Project Characteristics

Essential data of the project is presented in the following Table 2-1.

Table 2-1: Project Characteristics

Item	Data
Project title	Bangna Starch Wastewater Treatment and Biogas Utilization Project
Project size	☐ Large Scale ☒ Small Scale
Project Scope (according to UNFCCC sectoral scope numbers for CDM)	☐ 1 Energy Industries (renewable- /non-renewable sources)
	☐ 2 Energy distribution
	☐ 3 Energy demand
	☐ 4 Manufacturing industries
	☐ 5 Chemical industry
	☐ 6 Construction
	☐ 7 Transport
	☐ 8 Mining/Mineral production
	☐ 9 Metal production
	☐ 10 Fugitive emissions from fuels (solid, oil and gas)
	☐ 11 Fugitive emissions from production and consumption of halocarbons and hexafluoride
	☐ 12 Solvents use
	☒ 13 Waste handling and disposal
	☐ 14 Afforestation and Reforestation
	☐ 15 Agriculture
Applied Methodology	AMS-III.H (version9): Methane Recovery in Wastewater Treatment AMS I.D (version 13)Grid connected renewable electricity generation:
Crediting period	☒ Renewable Crediting Period (7 y) ☐ Fixed Crediting Period (10 y)
Start of crediting period ¹	1st August 2009

2.2 Involved Parties and Project Participants

The following parties to the Kyoto Protocol and project participants are involved in this project activity (Table 2-2).

Table 2-2: Project Parties and project participants

Characteristic	Party	Project Participant
Host party	Thailand	P&Papop Renewable Co., Ltd.
Other involved party	Switzerland	South Pole Carbon Asset Management Ltd.

¹ As per the published PDD (version 1)

2.3 Project Location

The details of the project location are given in table 2-3:

Table 2-3: Project Location

No.	Project Location
Host Country	Thailand
Region:	Kalasin
Project location address:	45 Rimmaenumparn, Theenanon Road, Yangthalat, Kalasin 46120
Latitude:	16°23'7.71"N
Longitude:	103°28'21.28"E

2.4 Technical Project Description

The technical key data are provided in table 2-4 below

Table 2-4: Technical data of the project activity

Parameter	Unit	Value
Gen-sets		
Manufacturer		GUASCOR S.A.
Engine Typ		SFGLD 560
Installed capacity	MW	3 x 0,95 = 2,85
Mechanical power	kWe	950
Alternator characteristic		
Manufacturer		Leroy Somer
Apparent Power	kVA	1182
Speed & Frequency	Rpm/Hz	1500/50
Flare		
Burner		Siemens

3 METHODOLOGY AND VALIDATION SEQUENCE

3.1 Validation Steps

The validation of the project consisted of the following steps:

- Contract review
- Appointment of team members and technical reviewers
- Publication of the project design document (PDD)
- A desk review of the PDD^{/PDD/} submitted by the client and additional supporting documents with the use of customised validation protocol ^{/CPM/} according to the Validation and Verification Manual ^{/VVM/},
- Validation planning,
- On-Site assessment,
- Background investigation and follow-up interviews with personnel of the project developer and its contractors,
- Draft validation reporting
- Resolution of corrective actions (if any)
- Final validation reporting
- Technical review
- Final approval of the validation.

The sequence of the validation is given in the table 3.1 below:

Table 3.1: Validation sequence

Topic	Time
Assignment of validation	2007-10-12
Submission of PDD for global stakeholder commenting process	2008-09-27
On-site visit	2009-05-08
Draft reporting finalised	2009-05-15
Technical review on draft reporting finalised	2009-05-20
Final reporting finalised	2009-06-01
Technical review on final reporting finalised	2009-06-05

3.2 Contract review

To assure that

- the project falls within the scopes for which accreditation is held,
- the necessary competences to carry out the verification can be provided,
- Impartiality issues are clear and in line with the CDM accreditation requirements

a contract review was carried out before the contract was signed.

3.3 Appointment of team members and technical reviewers

On the basis of a competence analysis and individual availabilities a verification team, consistent of one team leader and 4 additional team members, were appointed. Furthermore also the personnel for the technical review and the final approval were determined.

The list of involved personnel, the tasks assigned and the qualification status are summarized in the table 3-2 below.

Table 3-2: Involved Personnel

	Name	Company	Function ¹⁾	Qualification Status ²⁾	Sectoral competence	Technical competence	Host country Competence	Controlling competence
☒ Mr. ☐ Ms.	Rainer Winter	TÜV NORD Cert	TL	SA	x	x	-	x
☒ Mr. ☐ Ms.	Alexander Richter	TÜV NORD Cert	TM	TE	-	x	-	-
☒ Mr. ☐ Ms.	Jochen Schubert	TÜV NORD Cert	TM	E	x	x	-	-
☒ Mr. ☐ Ms.	Sornchana, Pattanun	TÜV NORD Cert	TM	T	-	x	x	-
☒ Mr. ☐ Ms.	Thongsong, Saowalak	TÜV NORD Cert	TM	T	-	x	x	-
☒ Mr. ☐ Ms.	Eric Krupp	TÜV NORD Cert	FA	SA	x	x	-	x



	Name	Company	Function ¹⁾	Qualification Status ²⁾	Sectoral competence	Technical competence	Host country Competence	Controlling competence
☒ Mr. ☐ Ms.	Martin Saalmann	TÜV NORD Cert	TR	A	x	x	-	x

¹⁾ TL : Team Leader; TM : Team Member, TR: Technical review; FA: Final approval

²⁾ GHG Auditor Status: A : Assessor; E : Expert; SA: Senior Assessor; T : Trainee; TE Technical Expert

Certificates of appointment for the above mentioned team members are enclosed in annex 6 of this report.

3.4 Consideration of Public Stakeholder Comments

Acc. to the modalities and procedures the draft PDD, as received from the project participants, has been made publicly available on the dedicated UNFCCC CDM website prior to the validation activity commenced. Stakeholders have been invited to comment on the PDD within the 30 days public commenting period.

In case comments were received, they are taken into account during the validation process. The comments and the discussion of the same are documented in annex 5 of this report.

No comments were received during the global stakeholder consultation period. This was checked on the UNFCCC web page (<http://cdm.unfccc.int/Projects/Validation/DB/36WM86R87J04LDSV1QA9SWIE04S87W/view.html>) respectively on the TÜV Nord webpage (<http://www.global-warming.de/e/1758/>).

3.5 Validation Protocol

In order to ensure consideration of all relevant assessment criteria, a validation protocol is used. The protocol shows, in a transparent manner, criteria and requirements, means of validation and the results from pre-validating the identified criteria. The validation protocol reflects the generic CDM requirements each CDM project has to meet as well as project specific issues as applicable. The validation protocol serves the following purposes:

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

The validation protocol as described in Figure 1.

Validation Protocol Table A-1: Requirement checklist				
Checklist Item	Validation Team Comment	Reference	Draft Conclusion	Final Conclusion
<i>The checklist items in Table A-1 are linked to the various requirements the project should meet. The checklist is organised in various sections. Each section is then further sub-divided as per the requirements of the topic and the individual project activity.</i>	<i>The section is used to elaborate and discuss the checklist item in detail. It includes the assessment of the validation team and how the assessment was carried out. The reporting requirements of the VVM shall be covered in this section.</i>	<i>Gives reference to the information source on which the assessment is based on</i>	<i>Assessment based on evidence provided if the criterion is fulfilled (OK), or a CAR, CR or FAR (see below) is raised. The assessment refers to the draft validation stage.</i>	<i>In case a corrective action or a clarification the final assessment at the final validation stage is given.</i>

Figure 1: Validation protocol tables

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

3.6 Review of Documents

The published PDD (version 1) and supporting background documents related to the project design and baseline were reviewed.

Furthermore, the validation team used additional documentation by third parties like host party legislation, technical reports referring to the project design or to the basic conditions and technical data.

3.7 Follow-up Interviews

The validation team has carried out interviews in order to assess the information included in the project documentation and to gain additional information regarding the compliance of the project with the relevant criteria applicable for CDM.

During validation the validation team has performed interviews to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarized in table 3-3.

Table 3-3: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
Project proponent representatives Project consultant	- Chronological description of the project activity with documents of key steps of the implementation. - Commissioning date - Procedure COD measurement (Log- sheets, equipment etc) - Training of employment - Technical details of the project realization, designing, operational life time, monitoring of the project - Meter readings - Scada System monitoring and measurement equipment and system (amount of waste water, biogas, electricity generation since commissioning, CH₄ content of biogas) - Operation Hours biogas gensets - Host Government Approval - Approval procedures and status - Financial aspects (Boot contract) - Crediting period - Project activity starting date - CER allocation / ownership - Additionality - Sustainable development issues - Monitoring - Analysis of local stakeholder consultation - Roles & responsibilities of the project participants w.r.t. project management, monitoring and reporting - National Legislation - Editorial issues of the PDD

A comprehensive list of all interviewed persons is part of section 7 'References'.

3.8 Project comparison

The validation team has compared the proposed CDM project activity with similar projects or technology that have similar or comparable characteristics and with similar projects in the host country in order to achieve additional information esp. regarding:

- Project technology
- Additionality issues
- Reasons for reviews, requests for reviews and rejections within the CDM registration process.

3.9 Resolution of Clarification and Corrective Action Requests

3.9.1 Definition

A **Corrective Action Request (CAR)** will be established where:

- mistakes have been made in assumptions, application of the methodology or the project documentation which will have a direct influence the project results,
- the requirements deemed relevant for validation of the project with certain characteristics have not been met or
- there is a risk that the project would not be registered by the UNFCCC or that emission reductions would not be able to be verified and certified.

A **Clarification Request (CL)** will be issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

A **Forward Action Request (FAR)** will be issued when certain issues related to project implementation should be reviewed during the first verification.

3.9.2 Draft Validation

After reviewing all relevant documents and taken all other relevant information into account, the validation team issues all findings in the course of a draft validation report and hands this report over to the project proponent in order to respond on the issues raised and to revise the project documentation accordingly.

3.9.3 Final Validation

The final validation starts after issuance of the proposed corrective action (CA) of the CARs CLs and FARs by the project proponent. The project proponent has to reply on

those and the requests are “closed out” by the validation team in case the response is assessed as sufficient. In case of raised FARs the project proponent has to respond on this, identifying the necessary actions to ensure that the topics raised in this finding are likely to be resolved at the latest during the first verification. The validation team has to assess whether the proposed action is adequate or not.

In case the findings from CARs and CLs cannot be resolved by the project proponent or the proposed action related to the FARs raised cannot be assessed as adequate, no positive validation opinion can be issued by the validation team.

The CAR(s) / CL(s) / FAR(s) are documented in chapter 4.

3.10 Technical review

Before submission of the final validation report a technical review of the whole validation procedure is carried out. The technical reviewer is a competent GHG auditor being appointed for the scope this project falls under. The technical reviewer is not considered to be part of the verification team and thus not involved in the decision making process up to the technical review.

As a result of the technical review process the validation opinion and the topic specific assessments as prepared by the validation team leader may be confirmed or revised. Furthermore reporting improvements might be achieved.

3.11 Final approval

After successful technical review of the final report an overall (esp. procedural) assessment of the complete validation will be carried out by a senior assessor located in the accredited premises of TÜV NORD.

Only after this step the request for registration can be started (in case of a positive validation opinion).

4 VALIDATION FINDINGS

In the following table the findings from the desk review of the published PDD, visits, interviews and supporting documents are summarised:

Table 4-1: Summary of CARs, CLs and FARs issued

Validation topic ¹⁾	No. of CAR	No. of CL	No. of FAR
General description of project activity (A) - Project specification - Technical project description - Participation - Contribution to sustainable development - PDD editorial aspects - Technology to be employed	1	1	-
Project Baseline, Additionality and Monitoring Plan (B) - Application of the Methodology - Project Boundary - Baseline identification - Calculation of GHG emission reductions - Project emissions - Baseline emissions - Leakage - Additionality determination - Monitoring Methodology - Monitoring Plan - Project management planning	10	7	-
Duration of the Project / Crediting Period (C)	-	1	-
Environmental impacts (D)	-	-	-
Stakeholder Comments (E)	-	-	-
SUM	11	9	-

¹⁾ The letters in brackets refer to the validation protocol

The following tables include all raised CARs, CLs and FARs. For an in depth evaluation of all validation items it should be referred to the validation protocols (see Annex 1).

The findings of validation process are summarized in the tables below.

General	Finding A1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding	Inconsistencies regarding installed capacity of gas engines in the PDD (section A2; A4.2; B5...)		
Corrective Action A1	The PDD is modified for consistency in reported value of Gas Engine Generator. The same is validated during site visit.		
DOE Assessment A1	Installed capacity revised and checked during site visit.		
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

General	Finding A2		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding	The coordinates of the project are not locatable and need revision.		
Corrective Action A2	The coordinates are updated in revised PDD.		
DOE Assessment A2	Coordinates revised.		
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

General	Finding B1		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding	Section B.5. The section has to be improved as the starting date of the project activity is before the validation; so the project proponent shall provide an implementation timeline of the proposed CDM project activity (see EB 41 Annex 46). Please indicate the date, event and sources of the Management Decision.		

General	Finding B1
Corrective Action B1	The section B.5 of PDD is improved to include the information relevant to CDM and project implementation schedule.
DOE Assessment B1	For the validation of the key events to assess the prior consideration of CDM please refer to section 5.2.5 "Additional Assessment". Please also refer to Finding B11.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B2
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding	Clarification is requested regarding biogas production calculation: • Conversion from kg CH₄ / year divided by 65% to Nm³/ year (IRR calculation; sheet: 3.1 biogas production). • According to the technical data sheet (UASB reactor) the biogas production rate is about 0.4 -0.5 m³ per kg COD removal. • According to Hydraulic and COD Mass Balance sheet the Biogas produced is defined as 30,000 Nm³/d.
Corrective Action B2	The different sources, don't indicate any inconsistency in the estimations and calculations, rather justify the figures based on which the design of equipments are finalized, moreover very realistic figures are used for financial and GHG calculations. - The estimation of biogas quantity based on methane content as per the methodological formulae is the realistic estimation of biogas. The starch plants cannot operate at full capacity. As observed during site visit, the waste water generation used for estimation purpose is very optimistic and highly conservative for IRR estimations. - The values referred to in technical proposal are technical design values proposed by technology supplier. - The equipment design is usually based to take care of any fluctuations in generation which might occur due to process fluctuations and are designed to take higher loads for safety reasons. The hydraulic mass balance sheet shows high values but these are nowhere close to expected operational values for normal operation of starch plant and biogas unit (As confirmed during site visit, ex-post values for 1st year of operation are much lower than expected and design values.). The density of methane is incorporated into the revised calculation and PDD is revised accordingly.

General	Finding B2
DOE Assessment B2	Conversion from kg CH₄ / year divided by 65% to Nm³/ year (IRR calculation; sheet: 3.1 biogas production). The amount of biogas calculated doesn't correspond to the amount of kg CH₄ calculated, as the density of CH₄ is not taken into account. Revision is necessary. Please also refer to Finding B3. Density of CH₄ considered in IRR calculation. During site visit the biogas production was verified as appropriate by means of data from Scada system and meter readings.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B3
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding	For biogas production values from the methodology AMS III.H (MCF factor and B_{OW}) were used. According to Annex 10 EB 38 the input values in all investment analysis should be applicable at the time of the investment decision. Please also refer to CAR B1. For IRR calculation an energy production of 7,555,196 kWh per year is defined. According to the PDD the installed capacity of the project is 2.85 MW_{el} (plus future expansion of up to 1.4 MW_{el}). Therefore the operating hours of the gen-sets are 2650h respectively 1770h per year. Clarification is requested.
Corrective Action B3	THE MCF and B_{OW} values correspond to the applicable version of methodology. The power generation values are revised as per Finding B2 and as per the same the power generation hours for 2.85MW capacity are 3700h approximately. As discussed during site visit, expansion of gas engine capacity seems improbable at this time as current generation capacity is more than enough to meet the requirement for biogas generated. The calculations for IRR do not consider any extra investment for additional gas engine or any revenues from additional generation of power. The PDD is modified accordingly.

General	Finding B3
DOE Assessment B3	By means of Scada system and meter readings the electricity generation used for IRR calculation deemed to be appropriate. Please also refer to Finding B2.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B4
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding	Clarification is requested regarding EF_{grid} : - According to section B.6.2 the EF defined as 0.52 tCO₂/MWh is confirmed by validator of the registered CDM project Korat Waste. W.r.t project the EF factor is defined as 0.524 tCO₂/MWh; the calculation bases on values from years 2002 to 2004. - As mentioned in section B.6.2 the EF 0.52 tCO₂/MWh is published by the Electricity Generating Authority of Thailand (EGAT). Please provide evidences. - Annex 3 includes an EF calculation (EF=0.5265); the calculation bases on the "UNFCCC Tool" as well on data from year 2006. As the PDD was published on 27th September 2008 the EF calculation should base on actual values.
Corrective Action B4	The GEF value is revised to latest available value as per government published data in Thailand. The value used is changed to 0.5057tCO ₂ /MWh
DOE Assessment B4	GEF value is revised in the PDD. Please revise also source of data of $EF_{grid,y} = EF_y$ in section B.6.2. Please provide revised ER- calculation.
Corrective Action B4	The source of data is revised in the PDD. Revised ER calculations provided
Corrective Action B4	PDD revised; ER calculation provided.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B5		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding	The monitoring section has to be improved regarding back up metering in case of meter malfunction. Furthermore the emission reduction calculation ex-post is unclear. According to the methodology the calculation of emission reduction shall be based on the amount of methane recovered and flared that is monitored ex-post. Project emission will be deducted from the emission reductions calculated.		
Corrective Action B5	The BOOT operator shall make sure that all the readings are taken on time and as per the monitoring methodology. To ensure conservativeness of emission reduction estimation the emission reduction shall be estimated using both ex-post and ex-ante approach and use the conservative of the two approaches to estimate emission reductions in ex-post scenario. The two approaches depend on different monitored parameters; thereby ensure that conservative approach will be adopted for estimation of Emission reductions. The Emission reduction calculation as per ex post approach are actually irrelevant at this point of time, since they will be based on amount of methane recovered, used and flared as per the monitored values of biogas generation.		
DOE Assessment B5	According to the VVM the DOE shall assess if the means of implementation of the monitoring plan, including data management and quality assurance and quality control procedures, are sufficient to ensure that the emission reduction can be reported ex post and verified. Monitoring section has to be improved regarding back up metering. Explanation regarding ex-post calculation is comprehensible, but not included in the PDD. The PDD is the basis for the verification and should be improved.		
Corrective Action B5	The expost approach for calculation is incorporated in PDD. For Monitoring plan and data management, PDD is revised to include the details of monitoring system at the project site in section B.7. 2 and Annex -4; including QA / QC measures adopted by operation personel. Volume and energy balance for the monitored data based on readings from generation and usage sides shall ensure conservativeness and transparency of emission reduction calculations.		
DOE Assessment B5	Monitoring section as well Annex 4 includes back up metering. Ex-post calculation approach incorporated in the PDD.		

General	Finding B5
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B6
Classification	☐ CAR ☒ CL ☐ FAR
Description of finding	Section B.6.1 leakage: Section should be improved regarding equipment transfer.
Corrective Action B6	Incorporated in revised PDD.
DOE Assessment B6	PDD revised all the equipments are purchased first hand .
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B7
Classification	☐ CAR ☒ CL ☐ FAR
Description of finding	Section B.7.1 data and parameters to be monitored: • Revision of description ECy is necessary. • Sufficient temperature in flare detection period: According to the methodology (open flares) 0% default value should be used for the period, if at any given time the temperature of the flare is below 500°C.
Corrective Action B7	- ECy description revised. - In the project activity closed flare is installed. PDD is corrected for same.
DOE Assessment B7	EC _y revised; As indicated on page 6 an open flare is installed and therefore revision is unacceptable.
Corrective Action B7	The PDD is revised for closed flare as validated during site visit.
DOE Assessment B7	PDD revised.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B8		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding	Clarification is requested regarding parameters DOC_F , $DOC_{y,s, final}$ and Fraction of CH ₄ in landfill gas mentioned in section B.6.2.		
Corrective Action B8	The same is due to typographic errors and is corrected in the revised version of PDD.		
DOE Assessment B8	Parameters deleted.		
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

General	Finding B9		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding	Starting date has to be revised.		
Corrective Action B9	Revised and the documentary evidence shall be provided.		
DOE Assessment B9	Starting has been revised to 20/7/2006 (the date of first purchase order (pile)).		
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements		

General	Finding B10		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding	According to the revised PDD dt. 05/05/2009 "the project reduces emission reductions by capturing the fugitive emissions from the waste water and using the biogas to generate heat and power for the industrial facility. The thermal capacity and power generation capacity of facility shall not exceed 45 MW _{th} and 15 MW _{el} respectively." Clarification is requested.		
Corrective Action B10	Incorporated in PDD in Section B.5. The installed power generation capacity is 2.85MW. And there is no separate heat energy generation in project activity.		
DOE Assessment B10	Explanation included.		

General	Finding B10
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B11
Classification	☐ CAR ☒ CL ☐ FAR
Description of finding	The table on page 12 of the PDD stating the project history need revision due to the following reasons imprecise statements and missing information w.r.t. installation, commissioning etc.
Corrective Action B11	The PDD is modified to correct the timeline of project implementation as per the available documents.
DOE Assessment B11	Table has been cross checked with supporting documents and is now consistent with the same.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

General	Finding B12
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding	The PP is requested to demonstrate the sales of produced electricity from the biogas generators in a clear and unambiguous manner in respective sections of the PDD. Further elaboration shall be provided of how the imported electricity from the grid is used. In doing so clarification shall be provided why statements in PDD posing electricity sales from P&Papop to the grid operator (EGAT) contradict to the statements in BOOT contract that pose the purchase of electricity by Bangna Starch.
Corrective Action B12	The sale of power never happens to Bangna, this was never planned. The mistake in the PDD is corrected, and all the power generated is supplied to grid as validated during the site visit. BOOT Contract is provided as a reference document.
DOE Assessment B12	The BOOT contract submitted for validation is consistent with the situation as described in the PDD and witnessed on site.

General	Finding B12
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B13
Classification	☐ CAR ☒ CL ☐ FAR
Description of finding	Further elaboration concerning the Minimum Lending Rate should be presented in relevant sections of the PDD. In respect of this the PP should clarify the respective date / duration on which the MLR percentage base. The PP should comprehensively demonstrate the appropriateness of MLR as benchmark value for the project IRR.
Corrective Action B13	As per EB41, Annex-45, the MLR is an appropriate benchmark for the investment analysis. The project proponent has estimated project IRR based on total inflow and outflow to project activity. MLR is most conservative approach to benchmark determination as it assesses the potential of project activity to payback the debt incurred during project development. A better approach to project IRR is WACC (considering respective return expected on debt and equity); however the proponent has selected a conservative approach to investment analysis to keep the calculations transparent. MLR value is taken at the time of project consideration i.e. 1st November 2005; the source of same is made available and included in PDD.
DOE Assessment B13	The chosen benchmark (MLR) is in line with the guidance in EB 41, Annex 45 and deemed appropriate and conservative as the lowest available percentage has been chosen at the time of taking the investment decision.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☒ The project complies with the requirements

General	Finding B14
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General	Finding B14		
Classification	☒ CAR	☐ CL	☐ FAR
Description of finding	The investment calculation shall be revised taking into account the following aspects: • Tables in Thai shall be translated into English • Provision of accessible sources for inflation rate of November 2005 • Indication of number of employees • Justification of approach followed for calculating operation and maintenance cost for operating biogas plant • Justification of parameter "use of waste water". As per the P&Papop proposal as of October 2005 an electricity price discount (25%) was assumed for Bagna Starch factory. In the current project design IRR-calculation this value is re-named into <i>use of waste water</i>. However, since the electricity buyer is now EGAT and no discounts are granted seems this value unacceptable. • Clarification is requested, whether maintenance costs for biogas plant, i.e. 1,439,000 THB, do include already wages and salary. If so the reason for consideration of wages and salary multiple times should be provided • A realistic increase rate for the electricity price should be presented as the power purchase agreement does not define a (fixed) price for the electricity sold to EGAT. • Electricity production rate shall be transparently presented by inclusion of a formula • Clarification is requested why VAT of investment costs can be considered as an expense in comparison with the benchmark MLR • Adjustment of PDD and GS Annex in accordance with new data concerning the above requests necessary.		
Corrective Action B14	• The revised IRR calculation includes tables in English. • The source of inflation is referred in revised excel sheet. • 9 people are employed for the purpose of project activity. • As per discussion on site, the operation and maintenance is based on experience. However, a formal contract is in place between P & Papop Renewable and Papop (company) for operation, maintenance and human resources for BOOT project. The copy of proposal is provided. The details provided by the equipment supplier i.e. as engine also refer to similar costs. • The BOOT contract between Bangna and P & Paopo has a provision of 25% of electricity price to be paid by P & Papop in lieu of waste water usage and same is reflected in the excel sheet as waste water usage cost. • The separate cost for the salary and wages is deleted as the operation and maintenance cost already include this cost for man power. • A realistic increase in price of electricity is included in IRR		

General	Finding B14
	estimation and revised the IRR calculation. - The formula for calculation of electricity production rate is provided in excel sheet. The figure is based on technical specification provided by the gas engine supplier and is based on 100% load, which is optimistic as confirmed during site visit. - The investment cost inclusive of VAT gives a realistic and actual assessment of cost incurred for implementing project activity. The VAT component in the cash flow analysis shall be applied to both cost component and revenue component of project activity. Thereby the same shall be applied to cost components of the project activity. - PDD is revised for above corrections wherever applicable.
DOE Assessment B14	The investment calculation has been revised according to CAR B14. The calculation is now in line with the requirements and deemed appropriate and conservative. However, in contrast to the above statement VAT portion is now excluded from cash inflows and cash outflows and provides a clearer picture about incurrence of cost and revenues. All supporting documents or evidences to assumptions and calculations were submitted to the validation team and justify the validity of financial parameters.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B15
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding	The PP is solicited to submit the following documents for validation: - Electricity invoices for electricity import and export since 1st October 2007. - Taking over certificates for biogas reactor, biogas generators - Evidence to back up chemical consumption and price and maintenance cost for gas engine including overhaul - Employment contracts for total operation and maintenance staff → monthly salary shall be transparent - Technical data sheet biogas plant - Purchase order for main equipment, i.e. biogas reactor, biogas generators and flare - Attachment I and II to PPA - Bank loan approval and ODA declaration - Management decision to proceed with the project activity - Invitation letters for GS ISC - Minutes of the first board meeting

General	Finding B15
	• Original IEE including the development date • Evidences for starch production for the months of September 2008, December 2008 and March 2009 • Minutes of second board meeting • Operating license of the WWTP • Acknowledgement of transfer of operating license from Bangna Starch to P&Papop • The above documents shall be provided in scanned version including the signature
Corrective Action B15	• Electricity invoices copies provided during site visit. • Certificate for biogas reactor, please refer to technical data sheet biogas plant due to the project owner was the technology provider for the UASB system. And certificate for the generator is provided during the site visit. • Chemical consumption is provided during validation visit • Employment contract is provided. • Technical data sheet biogas plant is provided. • Purchase order is provided during validation • Attachment I and II to PPA will be discussed during the site visit. • Loan approval and ODA letter are provided. • Management decision is referred in minute of second board meeting. • Sample of invitation letters are provided. • Minute of the first board meeting is providing. • IEE is provided. • Starch production is provided for six days that was requested during the site visit. • Minutes of second board meeting. • Operating license is provided. Acknowledgement is referred in operating license
DOE Assessment B15	Supporting documents provided.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B16
Classification	☒ CAR ☐ CL ☐ FAR

General	Finding B16
Description of finding	- Total investment in table 1 in PDD page 12 shall clearly indicate whether VAT is included or excluded. - Operating cost in table 1 are inconsistent with IRR calculation - Table 2 and table 3 on page 13 and 14 of PDD need revision as values in brackets are imprecise. - Confusion of wording w.r.t. "Savings due to energy displacement (NPV million THB)" and "Savings due to energy displacement (IRR%)" in PDD pages 13 and 14 as well as in IRR calculation shall clarified. A detailed explanation with focus on the energy savings considered for IRR and NPV calculation shall be provided. - The final IRR of the project activity shall be stated in the PDD and assumptions in calculating the same explained. - Graphs on page 15 and page 16 in PDD need revision w.r.t. to applicable information and the revised data as requested above.
Corrective Action B16	- PDD Edited to include the information - Table1 improved as per IRR calculation - PDD revised for inclusion of new tables. - PDD corrected to reflect consistent headings for tables. - The IRR is stated in PDD and relevant assumptions added to PDD. - PDD revised. Only change in IRR is represented in sensitivity analysis to simplify the representation.
DOE Assessment B16	All editorial issues are improved in PDD and consistent with IRR calculation.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☒ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding B17
Classification	☒ CAR ☐ CL ☐ FAR
Description of finding	Following the guidance of EB 39, Annex 10, paragraph 16 the sensitivity analysis shall be revised as it is deemed necessary to vary parameters that constitute more 20% of the total project revenues, i.e. the assumed biogas amount. Additionally, inconsistent values within the sensitivity analysis were noticed leading to the necessary request for revision of the analysis.

General	Finding B17
Corrective Action B17	The sensitivity analysis on revenue from power generation for a range of -10% to +10% ensures that this change can as well happen due to change in quantity of biogas which directly reflects the change in IRR. A sensitivity analysis based on biogas amount would consider no change in electricity price and would reflect exactly the same behaviour as reflected by sensitivity based on electricity revenues. The sensitivity analysis is revised for inconsistencies due to typographic errors.
DOE Assessment B17	IRR calculation takes into account revenues and costs in accordance with EB 39, Annex 10, paragraph 16. The sensitivity analysis revealed that the benchmark value is crossed in case of a 10% decrease of investment cost. Assessment of investment analysis is provided in detail in section 5.2.5 as well as in Annex 3.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

General	Finding C1
Classification	☐ CAR ☒ CL ☐ FAR
Description of finding	Starting date of the crediting period has to be revised.
Corrective Action B11	Revised in PDD.
DOE Assessment B11	Starting date revised to 1 st August 2009.
Conclusion	☐ To be checked during the first periodic verification ☒ Appropriate action was taken ☐ Project documentation was corrected correspondingly ☐ Additional action should be taken ☐ The project complies with the requirements

5 VALIDATION ASSESSMENT SUMMARY

5.1 General Description of the Project Activity

5.1.1 Participation

LOA

The letters of approval have been received, with a clear reference to the supporting documentation. The letters were provided by the project participants.

The letters confirm that the Party is a Party to the Kyoto Protocol, that participation is voluntary, and that the project contributes to the sustainable development of the country (for the host Party). The LOAs refer to the precise project title in the PDD being submitted for registration.

The letters of approval are assessed as valid.

Project Participants

The project participants are listed in tabular form in section A.3 of the PDD and this information is consistent with the contact details provided in annex 1 of the PDD. At least one Party involved has approved the participation of each project participant, together with the letter of approval. No entities other than those approved or authorised to be project participants are listed or indicated in these sections of the PDD.

For an in depth evaluation of these topics, please refer to section A1 of the table 1 of the annex. This section also contains the CARs, CLs and FARs related to this topic.

5.1.2 Contribution to Sustainable Development

The contribution of the project activity to sustainable development of the host country has been confirmed within the host government approval ^{/HCA/}.

For an in depth evaluation of these topics, please refer to section A2 of the table 1 of the annex. This section also contains the CARs, CLs and FARs related to this topic.

5.1.3 PDD editorial Aspects

The PDD is in line with the structure and guidance given in the latest relevant PDD template ^{/PDD-T/} for type of project and the latest version of the guidelines for completing the PDDs ^{/GCP/}.

For an in depth evaluation of these topics, please refer to section A3 of the table 1 of the annex. This section also contains the CARs, CLs and FARs related to this topic.

5.1.4 Technology to be employed.

The description of the project as contained in the PDD is complete and accurate and provides the reader with a clear understanding of the nature of the project activity.

The technology and know-how used in the project activity is assessed to be environmentally safe and sound.

For an in depth evaluation of these topics, please refer to section A4 of the table 1 of the annex. This section also contains the CARs, CLs and FARs related to this topic.

5.1.5 Small Scale Projects

The project activity qualifies as a small-scale project activity and is within the thresholds of the three possible types of small-scale CDM project activities. The project applies the approved small-scale categories AMS-III.H (version 9) "Methane Recovery in Wastewater Treatment" and AMS I.D (version 13) "Grid connected renewable electricity generation". The small-scale methodologies is applied in conjunction with the general guidance to the methodologies that provides guidance on equipment capacity, equipment performance, sampling and other monitoring related issues.

The project is not a debundled component of a large scale project in accordance with the rules defined in appendix C of Annex II to Decision 4/CMP.1;

For an in depth evaluation of these topics, please refer to section A4 of the table 1 of the annex. This section also contains the CARs, CLs and FARs related to this topic.

5.2 Project Baseline, Additionality and Monitoring Plan

5.2.1 Application of the Methodology

The project applies to a valid version of a CDM Methodology approved by the board. All applied methodological tools are valid and approved. By means of cross check it can be confirmed that the applied methodology and the methodological tools are directly derived from the methodologies section on the CDM website^{/unfccc/}.

The project activity, meets all applicability conditions of the applied methodology, the applied methodological tools and all methodology components referred to in the applied methodology and tools. Beyond this, the proposed project activity meets all the other possible requirements or stipulations mentioned in all sections of the selected methodology.

Furthermore the project activity is not expected to result in significant emissions, related both to project and leakage, other than those listed in the methodology.

Summarised it is assessed that the project applies a valid version of an approved CDM methodology and the methodology is applicable to the project.

For an in depth evaluation of these topics, please refer to section B1 of the table 1 of the annex. This section also contains the CARs, CLs and FARs related to this topic.

5.2.2 Project Boundary

The PDD correctly describes the project boundary including the physical delineation of the project activity and the description of the emission sources and GHGs that are included in the project boundary for the purpose of calculating project and baseline emissions for this project activity.

No emission sources which are impacted by the project activity and are not addressed by the approved methodology are detected during validation.

For an in depth evaluation of these topics, please refer to section B2 of the table 1 of the annex. This section also contains the CARs, CLs and FARs related to this topic.

5.2.3 Baseline Identification

The procedure to identify the most plausible baseline scenario derived from the methodology tools has been applied correctly and is transparently and sufficiently documented in the PDD.

Summarised it can be assessed that the identified baseline scenario reasonably represents what would occur in the absence of the proposed project activity and the approved methodology used is applicable to the identified baseline scenario.

For an in depth evaluation of these topics, please refer to section B3 of the table 1 of the annex. This section also contains the CARs, CLs and FARs related to this topic.

5.2.4 Calculation of GHG Emission Reductions

The PDD applies steps and equations to calculate project emissions, baseline emissions, leakage and emission reductions as per the requirements of the methodology.

For the calculation of the GHG emission reductions the correct equations have been used reflecting the methodological choices. Furthermore all equations are applied correctly.

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 project and contribute to a conservative estimate of the emission reductions. For the data and parameters subject to monitoring it is confirmed that the emission reduction estimates provided in the PDD are reasonable and conservative.

For an in depth evaluation of these topics, please refer to section B4-B7 of the table 1 of the annex. This section also contains the CARs, CLs and FARs related to this topic.

5.2.5 Additionality Determination

Consideration of CDM in decision making

The starting date given in the PDD is before validation start. It is confirmed that this date has been reported in accordance with the CDM glossary of terms.

The incentive of the CDM was considered by the PP within the decision making process to go forward with the project. This consideration is based on the evidences transparently described in the PDD.

In October 2005 P&Papop prepared a proposal to develop the project as a BOOT project (Build, Own, Operate & Transfer). The proposal includes both a pre feasibility assessment and an analysis of the impact of CDM on the financial viability of the project. CDM was taken into account within the analysis. The proposal dated October 2005 was provided by the client ^{/PPP/}.

On 1st November 2005 the 1st Board Meeting was conducted to discuss the biogas project ^{/MM1/}. To reduce the financial risks of the project activity, CDM was considered to be of importance. Bangna Starch Co Ltd. authorized P&Papop Co. Ltd. to investigate the possibility to receive CDM revenues for the project activity in order to make an investment decision.

On 20 December 2005 the 2nd Board Meeting was conducted to discuss the project activity again. Here the decision to assign P&Papop Co. Ltd. as investor and operator of the biogas plant, including CDM ^{/MM2/} application, was made.

On January 2006 the BOOT contract between Bangna Starch Co., Ltd and P&Papop Renewable Co., Ltd was signed ^{/BOOT/}. The BOOT mentions CDM and states that Bangna Starch Co Ltd. gives all rights over CERs to P&Papop Co. Ltd (clause 10 of the Boot Contract). It is also determined that P&Papop Co. Ltd. is responsible to handle the procedure to obtain CERs from the project activity during the validity period of the BOOT contract. The BOOT contract was provided by the client ^{/BOOT/}.

On 12 May 2006 a confidentiality agreement was signed between P&Papop Co. Ltd and South Pole Carbon Asset Management determining the first formal step of CER sale/purchase negotiations ^{/CA/}.

On 16 Jan 2007 a Term Sheet was signed between South Pole Carbon Asset Management and Papop for governing the transaction of CERs of two projects, including the Bangna Starch project ^{/TS/}.

On 10 May 2007 an Appointment of Authorization from P&Papop Co. Ltd to South Pole Carbon Asset Management was signed, for carrying out CDM related interactions with final buyers, DNA and UNFCCC ^{/AP/}.

On 22 June 2007 South Pole Carbon Asset Management contracted Advanced Energy Plus Co. Ltd. to manage the stakeholder consultation meeting and IEE report for four projects, including the Bangna Starch project ^{/SC/}.

On 25 July 2007 an Initial CDM Stakeholder consultation was conducted/ISCR/.

On 17 September 2007 South Pole requested a validation contract from TÜV Nord.

All documents were provided and verified (please refer to chapter 7 References of the Final Validation Report). According to the “Guidance on the demonstration and assessment of prior consideration of the CDM (version 01)” from EB41, Annex 46, paragraph 5 (a) and (b) the verified documents prove that the project participants were aware of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project and (b) that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation.

Beyond this the consideration is assessed as serious (i.e. the project activity would not be undertaken without the incentive of the CDM).

These evidences were made available to the validation team and are assessed to be adequate for the purpose. Further it is confirmed that the decision was made by an authorised person. During validation it could be assessed that the person has the authority to taking corresponding decisions on behalf of the company.

Application of methodology / methodological tools

The additionality was justified in accordance with the requirements derived from the applied approved CDM methodology and the applied methodological tools referred to therein.

Investment analysis

(a) In the course of validating parameters used in the IRR calculation supporting documents provided by the PP have been utilised and relevant background information such as public available sources are taken into account as well. After closure of respective CARs / CLs the validation team arrived at the conclusion that the assumptions and computations in the IRR spreadsheet are in line with the supporting documents provided by the PP. Thus, the validity of IRR calculation can be confirmed. The calculation of the financial indicator (project IRR) reflecting the project's feasibility in financial terms has demonstrated its additionality when comparing the IRR of 5.24% with the benchmark value – Minimum Lending Rate (MLR) of 6.56%. Moreover, the sensitivity analysis revealed that the variation of key financial parameters substantiate project's additionality as the benchmark is still not crossed except in case the investment costs decrease by 10%. However, meeting

the benchmark by 10% reduction of investment cost is an unlikely event as observed during the site visit. Actual values further substantiate the unlikelihood of a 10% decrease of investment costs. For a detailed assessment on financial parameters please refer to Annex 3;

(b) Furthermore the applied benchmark value – Thai Minimum Lending Rate (MLR) – has been further explained and discussed with the PP during site visit. Investigations on its conservativeness revealed that this value is comparatively low considering other dates at the time of taking the investment decision.

Summary

The procedure to justify the additionality of the project activity derived from the methodology or required methodological tools has been applied correctly and is transparently and sufficiently documented in the PDD.

Considering all statements above, it is confirmed that the project activity is additional because anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the project activity.

For an in depth evaluation of these topics, please refer to section B8 of the table 1 of the annex. This section also contains the CARs, CLs and FARs related to this topic.

5.2.6 Monitoring Methodology

The monitoring parameters are identified as follows: Amount of electricity consumed and generated; Degradable carbon content of the wastewater before and after the treatment; flow of wastewater; amount of biogas produced, biogas sent to gen-sets and closed flare, CH₄ content of the biogas, temperature of the flare.

The ex-post emission reduction calculation bases on the amount of methane recovered and flared. The project emissions will be deducted from the emission reductions calculated

Measurement of the amount of final sludge generated also mentioned in monitoring section. The monitoring plan is in compliance with the requirements of the methodology;

5.2.7 Monitoring Plan/ Project Management Planning

During site visit it was observed that the monitoring plan was implemented according to the requirements of the methodology.

5.2.8 Crediting Period

The starting date of the project activity is defined as the date of the 1st purchase order for the foundation pile as of 20th July 2006. The starting date as mentioned in the PDD has been cross checked with the purchase order^{/SD/} and compared with the definition given in CDM glossary of terms. The starting date is deemed correct.

The starting date of the 1st crediting period is 01/08/2009 and deemed to be appropriate.

5.2.9 Environmental Impacts

According to the regulation National Environmental Quality Act B.E. no EIA is required for this kind of project activity. Regarding electricity generation an EIA is required up to 10 MW capacity.

An Initial Environmental Evaluation (IEE) was conducted; here no serious negative environmental impacts of the project activity are described.

5.2.10 Comments by Local Stakeholders

Local stakeholders (government representatives, local officials, NGOs, academic institutions) have been invited before publishing the PDD. A public consultation event (based on Gold Standard stakeholder consultation criteria) was held on July 25, 2007 at Rimpao Hotel, Kalasin Province. No critical comments by attendances were received during the above mentioned stakeholder process. This was confirmed by stakeholder interview^{/IM03/}.

6 VALIDATION OPINION

South Pole Carbon Asset Management Ltd. has commissioned the TÜV NORD JI/CDM Certification Program (CP) to validate the project: “ Bangna Starch Wastewater Treatment and Biogas Utilization Project” with regard to the relevant requirements of the UNFCCC for CDM project activities, as well as criteria for consistent project operations, monitoring and reporting. UNFCCC criteria include article 12 of the Kyoto Protocol, the modalities and procedures for CDM (Marrakech Accords) and the relevant decisions by COP/MOP and CDM Executive Board.

In the course of the pre-validation 11 CARs Corrective Action Requests (CARs) and 9 CLs Clarification Requests (CLs) were raised and successfully closed.

The review of the project design documentation and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and review of comments by parties, stakeholders and NGOs have provided TÜV NORD JI/CDM CP with sufficient evidence to validate the fulfilment of the stated criteria.

In detail the conclusions can be summarised as follows:

- The project is in line with all relevant host country criteria (Thailand) and all relevant UNFCCC requirements for CDM. Project activity approval have been obtained from DNA of Thailand vide the Letter of Approval (HCA) dated 2008-06-16 from DNA of Switzerland dated 2009-05-25.
- The project additionality is sufficiently justified in the PDD.
- The monitoring plan is transparent and adequate.
- The calculation of the project emission reductions is carried out in a transparent and conservative manner, so that the calculated emission reductions of 291,908 tCO₂e are most likely to be achieved within the (1st renewable) crediting period.

The conclusions of this report show, that the project, as it was described in the project documentation, is in line with all criteria applicable for the validation.

Essen, 2009-11-10



Rainer Winter
TÜV NORD JI/CDM Certification Program
Validation Team Leader

Essen, 2009-11-10



Eric Krupp
TÜV NORD JI/CDM Certification Program
Senior Assessor

7 REFERENCES

Table 7-1: Documents provided by the project participant (Bangna Starch Project)

Reference	Document
/API/	Appointment of authorization from P&Papop Co. Ltd to South Pole Carbon Asset Management, for carrying out CDM related interactions with final buyers, DNA and UNFCCC dt. 10 May 2007
/APPI/	Approvals from : - Electricity Operation Permission no. กกพ.ฟ 008/2551 since 10.04.2008 – 09.04.2009 - Electricity Supply Permission 3570 KVA no. พน. 0603.2/1398 date 13.05.08 - Permission operating of conservation energy ที่ พน. 0603.2/1397 for GUASCOR/SPAIN 330.363 size 1190 KWA code 46-401-016-51 GUASCOR/SPAIN 330.365 size 1190 KWA code 46-401-017-51 GUASCOR/SPAIN 330.364 size 1190 KWA code 46-401-018-51 Issued since 13.05.08 to 12.05.12
/BLGE/	Bill of Loading Gas Engine
/BOOT/	Build, Own, Operate and Transfer contract dt. January 2006
/BOOT -1/	Build, Own, Operate and Transfer contract dt. September 2008
/CAI/	Confidentiality agreement between P&Papop Co. Ltd and South Pole Carbon Asset Management determining the first formal step of CER sale/purchase negotiations dt 12 May 2006
/CCI/	Chemical costs purchase order (sample)
/CMC/	COD measurement campaign dt. August, September, October 2007
/CTR/	Commissioning test report for 3 gensets on 21.12.07
/Dede/	The estimation of emission factor for an electricity system in Thailand 2007 from the Bureau of Energy Research Department of Alternative Energy Development and Efficiency Ministry of Energy http://www2.dede.go.th/cdm/520126_GridEmission2007.pdf
/DLL/	Depth Lagoon Layout
/ERPA/	Emission reduction purchase agreement dt. 11.October 2007

Reference	Document
/ECEI/	Electricity Consumption and Export Invoices
/EMRR/	Electricity Meter Reading Reports
/FSR/	Feasibility Study Report
/HCA/	Host Country Approval from Thai DNA dt. 2008-06-16
/ICE/	Electricity selling invoices
/IEE/	Initial Environmental Evaluation report dt. 30 th September 2007
/ISCR/	Initial Stakeholder consultation Report
/IVL/	Stakeholder Invitation letters
/LOA/	Letter of Approval from Switzerland dt. 2009-05-25
/MM1/	1 st Board meeting dt. 1 st November 2005
/MM2/	2 nd Board meeting 20 th December 2005
/MOC/	Modalities of Communication
/OMBFG/	Operation and Maintenance Procedure for Bioreactor, Flare and Gas Engine
/OPLS/	Operating liscence dt. 28 September 2007
/PCPI/	Technical Proposal P & Papop
/PDD/	Draft Project Design Document named "<Bangna Starch Wastewater Treatment and Biogas Utilization Project >" hosted from 2008-09-27 to 2008-10-27 Project Design Document Bangna Starch Wastewater Treatment and Biogas Utilization Project; version 3; 12/05/2009 Project Design Document Bangna Starch Wastewater Treatment and Biogas Utilization Project; version 3.1; 25/09/2009
/PFD/	Process Flow Diagram indicating sampling point and field instrument
/POFS/	Purchase Order Flare System

Reference	Document
/POGE/	Purchase Order Gas Engine
/PPA/	Power Purchase Agreement
/PPP/	P&Papop proposal
/SC/	South Pole Carbon Asset Management contracted Advanced Energy Plus Co. Ltd. to manage the stakeholder consultation meeting and IEE report for four projects, including the Bangna Starch project dt. 22 Jun 2007.
/SCADA/	Monthly Report Biogas Plant from SCADA
/SCGE/	Supply Contract Gas Engine
/SD/	Proof of starting date Purchase Order Pile 20 th July 2006
/SHCP/	Stakeholder consultation process evidences
/SOBP/	Sample Offer Biogas Plant P&Papop
/SPR/	Starch production Records (sample years 2006,2007,2008)
/SSS/	SCADA System Screenshot
/TDSR/	Technical Data Sheet UASB Reactor
/TS/	Term Sheet between South Pole Carbon Asset Management and Papop for governing the transaction of CERs of two projects, including the Bangna Starch project dt. 16 Jan 2007
/TSSF/	Technical Specification Sheet Flare
/WAR-FE/	Wastewater Analysis Report from Environmental Engineering Laboratory of Faculty of Engineering (After project established), Khonkaen University report
/XLS-ER/	Emission reduction calculation spreadsheet
/XLS-IRR/	IRR calculation spreadsheet

Table 7-2: Background investigation and assessment documents

Reference	Document
/AAB/	Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities
/AMSIII-H/	AMS-III.H (version9) : Methane Recovery in Wastewater Treatment
/AMS.I-D/	AMS I.D (version 13)Grid connected renewable electricity generation:
/AT/	Tool for the demonstration and assessment of additionality
/CPM/	TÜV NORD JI / CDM CP Manual (incl. CP procedures and forms)
/CMP/	Report of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol on its first session, held at Montreal from 28 November to 10 December 2005; 7/CMP.1
/GCP/	UNFCCC: Guidelines for completing CDM-PDD and CDM-NM
/GIA/	Guidance on the Assessment of Investment Analysis
/GSR/	Gold Standard Requirements
/GSVR/	Gold Standard Validation Report
/GT/	CDM glossary of terms
/IPCC-GPI/	IPCC Good Practice Guidance & Uncertainty Management in National Greenhouse Gas Inventories, 2000
/IPPC-RM/	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual
/KPI/	Kyoto Protocol (1997)
/MA/	Decision 3/CMP. 1 (Marrakesh – Accords & Annex to decision (17/CP.7))
/PDD-T/	Project Design Document Form (CDM PDD) - Version 03
/PEA/	Provincial Electricity Authority
/TA/	Tool for the demonstration and assessment of additionality (Ver. 4 – Ver. 5.2).

Reference	Document
/TAS/	Thai Accounting Standards: “Royal Decree by Revenue Code #145/1984”
/VVM/	Validation and Verification Manual (Version 1, Annex 3; EB 44)

Table 7-3: Websites used

Reference	Link	Organisation
/bot/	http://www.bot.or.th/	Bank of Thailand
/dna/	http://www.tgo.or.th/	Thailand Greenhouse Gas Management Organization (Public Organization)(TGO) (DNA of Thailand)
/cd4cdm/	www.cd4cdm.org	UNEP Riso Centre
/dede/	http://www.dede.go.th/dede/	Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy
/lr/	http://www.ratchakitcha.soc.go.th/RKJ/index/index.htm	Legal requirement
/ipcc/	http://www.ipcc-nggip.iges.or.jp/	IPCC publications
/spb/	http://www.egat.co.th/en/	Electricity Generating Authority of Thailand
/tmoc/	http://www.moc.go.th/	Thai Ministry of Commerce
/unfccc/	http://cdm.unfccc.int	UNFCCC

Table 7-4: List of interviewed persons

Reference	Mol ¹		Name	Organisation / Function
/IM01/	V	☒ Mr.	Harshpreet Sigh	CDM Project Manager

Reference	Moi ¹		Name	Organisation / Function
		☐ Ms		
//IM01/	V	☐ Mr. ☒ Ms	Pathathai Tonsuwonnont	CDM Country Product Manager
//IM02/	V	☒ Mr. ☐ Ms.	Wittaya Roydrant	Plant Manager
//IM02/	V	☒ Mr. ☐ Ms.	Suchai Rattananadhekul	Project Management Manager (P&PAPOP)
//IM02/	V	☒ Mr. ☐ Ms.	Watchara Boonyued	P&PAPOP Environmental Engineer
//IM03/	V	☒ Mr. ☐ Ms.	Chom Joratana	Head of the Village

¹⁾ Means of Interview: (Telephone, E-Mail, Visit)

ANNEX

- A1:** Validation Protocol
- A2:** Assessment of Baseline Identification
- A3:** Assessment of Financial Parameters
- A4:** Assessment of Barrier analysis
- A5:** Outcome of the GSCP
- A6:** Appointment certificates of the team members

ANNEX 1: VALIDATION PROTOCOL

Table A-1: Requirements Checklist

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
A. General Description of Project Activity				
A.1. Approval <i>The written approval of the parties involved is a mandatory requirement</i>				
A.1.1. Has the project provided written approvals of all parties involved?	According to the official Thai DNA webpage www.tgo.or.th. Host country approval (HCA) from Thai DNA was provided to the client. Letter of Approval (LOA) from Switzerland and Host country approval not provided to the DOE until now. During site visit PP confirmed to go for LOA approval within next weeks. LOA and HCA provided by project participant.	/HCA/ /LOA/	Not OK	OK
A.1.2. Are the approvals issued from organisations listed as DNAs on the UNFCCC CDM website?	Please refer to A.1.1 Approvals issued from organisations listed as DNAs on the	/HCA/ /LOA/	Not OK	OK

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
	UNFCCC website.	/UNFCCC/		
A.1.3. Do the written approvals confirm that the corresponding party is a Party to the Kyoto Protocol?	Please refer to A.1.1 Written approvals confirm that the corresponding party is a Party to the Kyoto protocol.	/HCA/ /LOA/	Not OK	OK
A.1.4. Do the written approvals confirm that the participation is voluntary?	Please refer to A.1.1 Written approvals confirm that participation is voluntary.	/HCA/ /LOA/	Not OK	OK
A.1.5. Does the written approval from the host country confirm that the project contributes to the sustainable development in the country?	Please refer to A.1.1 TGO confirms that the project contributes to sustainable development.	/HCA/ /LOA/ /dna/	Not OK	OK
A.1.6. Do the written approvals refer to the precise project title in the PDD submitted for registration?	Please refer to A.1.1 The written approvals refer to the precise title "Bangna Starch Wastewater Treatment and Biogas Utilization Project".	/HCA/ /LOA/	Not OK	OK
A.1.7. Are the written approvals unconditional with regard to A.1.3 to A.1.6?	Please refer to A.1.1 The written approvals are unconditional with regard to issues mentioned above.	/HCA/ /LOA/	Not OK	OK
A.1.8. Is the information regarding the project participants listed in section A3 and in Annex 1 of the PDD internally consistent to each other?	Information consistent.	/HCA/ /LOA/ /PDD/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
A.1.9. Are all project participants listed in the PDD approved at least by one Party involved?	Please refer to A.1.1 Project Participants listed in the PDD approved at least by one Party involved. Checked with Ref.	/HCA/ /LOA/	Not OK	OK
A.1.10. Are any other project participants approved but not listed in the PDD?	Please refer to A.1.1 P&Papop Renewable Co., Ltd. and South Pole Carbon Asset Management Ltd. are approved and listed in the PDD.	/HCA/ /LOA/ /PDD/	Not OK	OK
A.2. Contribution to Sustainable Development <i>The project's contribution to sustainable development is assessed.</i>				
A.2.1. Has the host country confirmed that the project assists it in achieving sustainable development?	Thai DNA confirmed project's contribution to Sustainable Development in LoA.	/HCA/ /dna/	OK	
A.2.2. Will the project create other environmental or social benefits than GHG emission reductions?	Improvement of the local air quality. In the baseline the wastewater is diverted into open lagoons; CH ₄ and odorous	/IM02/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
	substances are emitted into the atmosphere. As a result of the project activity these emissions are captured within the encapsulated systems and destroyed due to biogas utilization. The implementation of the project also creates jobs during construction as well during operation of the plant. This could be confirmed by interviews during site visit.			
A.3. PDD editorial aspects <i>The PDD used as a basis for validation shall be prepared in accordance with the latest template and guidance from the CDM Executive Board available on the UNFCCC CDM website.</i>				
A.3.1. Has the latest version of the PDD form been applied?	The latest version applied.	/PDD-T/	OK	
A.3.2. Has the PDD been duly filled in accordance with the latest guidance(s)?	Largely the PDD has been filled in accordance with the latest guidance. Please also refer to CAR B1, CAR B5 and CL B6.		CAR B1, CAR B5 , CL B6	OK

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
A.4. Technology to be employed <i>Validation of project technology focuses on the project engineering, choice of technology and competence/maintenance needs. The DOE should ensure that environmentally safe and sound technology and know-how is used.</i>				
A.4.1. Does the PDD contain a clear, accurate and complete project description?	Largely the PDD contains a clear description of the project activity. The description of the project activity reflects the project activity implemented. The wastewater, which was treated in open lagoons, is diverted to the project activity. After pre-treatment steps the wastewater is diverted to the UASB reactor. The Biogas produced is used for electricity generation. During site visit PP confirmed that the electricity generated is delivered to the grid. Until now evidences are not provided to the DOE for verification. Please refer to CAR B12. Please also refer to CAR A1, as the installed capacity of the gen-set differs in the PDD.	/IM01/ /Site visit/ /PDD/	CAR A1 CAR B12	OK
A.4.2. Is this description in accordance with the real situation or (in case of greenfield projects) is it most likely that the project will be implemented acc to the project description	The description is in accordance with the real situation. Please also refer to A.4.1.	/site visit/	CAR B12	OK

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
A.4.3. In case the project involves alteration of the existing installation or process, is a clear description available regarding the differences between the project and the pre-project situation?	The project doesn't involve alteration		OK	
A.4.4. Does the project design engineering reflect current good practices?	For biogas collection from open lagoons mainly two different options can be observed. Firstly the encapsulation of the lagoons; secondly the diversion of the wastewater into anaerobic digesters, which comprises gas collection equipment. The advantages like costs, efficiency, process and controlling differ; nevertheless both of these options reflect current good practices. The project activity uses the diversion of the wastewater into an UASB reactor. Here the biogas is collected and utilized in gensets. The electricity is used. During site visit it was observed that the project design reflects current good practice. Furthermore P&Papop has experiences in the field of biogas production and utilization. This could also be confirmed during site visit.	/Site visit/ /OPLS/ /PCP/ /TDSR/ /TSFF/ /www.papop.com/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
A.4.5. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	The project uses state of the art technology. The UASB reactor as well the gen-sets from Guascor S.A are state of the art technology.	/Site visit/ /OPLS/ /PCP/ /TDSR/ /TSFF/ /www.papop.com/	OK	
A.4.6. Does the project make provisions for meeting training and maintenance needs?	Staffs were trained by Papop Co. Ltd before commissioning. The results of own COD measurements are verified by a third party regularly to identify maintenance and training needs regarding COD measurements.	/IM01/ /site visit/	OK	
A.5. Small scale project activity <i>It is assessed whether the project qualifies as small-scale CDM project activity</i>				
A.5.1. Does the project qualify as a small scale CDM project activity as defined in decision 4 / CMP.1 annex II?	The project qualifies as a small scale CDM project activity; Criteria defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM were checked.	/MA/ /CMP/ /PDD/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
A.5.2. Does the project apply one of the approved small scale categories and any methodology and tool referred therein?	The project applies methodology AMS-III.H version 9 and AMS-I.D version 13.	/AMS-III.H/ /AMS-I.D/ /unfccc/	OK	
A.5.3. Is the small scale project activity not a debundled component of a larger project activity?	Please refer to CAR A2 as the coordinates of the project are not accountable. The project is not being a debundled component of a larger project activity. As evidenced by check of the UNFCCC website and CDM pipeline as well as a result of interview no other wastewater project was identified within 1 km.	/CAR A2/ /IM01/	OK	
B. Project Baseline, Additionality and Monitoring Plan				
B.1. Application of the Methodology				
B.1.1. Does the project apply an approved and applicable CDM methodology and a valid version thereof?	The project applies the approved and applicable methodology AMS-III.H (version 9) and AMS-I.D (version 13). AMS-III.H (version 9) is valid until 9 th June 2009; AMS-I.D expires on 7 th December 09.	AMS-III.H/ /AMS-I.D/ /unfccc/	OK	
B.1.2. Is the applied CDM methodology identical with the version available on the UNFCCC website?	The applied CDM methodology is identical with the version available on the UNFCCC website.	AMS-III.H/ /AMS-I.D/ /unfccc/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
B.1.3. Are all applicability criteria in the methodology, the applied tools or any other methodology component referred to therein fulfilled?	Applicable criteria: The project activity introduces a sequential stage of waste water treatment with methane recovery and combustion to an existing wastewater treatment system without methane recovery. During site visit it was confirmed that the existing wastewater treatment system comprises a treatment of the wastewater in open lagoons without methane recovery. The sequential stage is the wastewater treatment in the UASB reactor. As the recovered methane is used for electricity generation the project activities uses the methodology AMS-I.D. This small scale methodology is applicable as the project activity comprises renewable energy generation units that supply electricity to the grid and exceed not the limit of 15 MW_{el}. During site visit an installed capacity of 2.85 MW_{el} could be observed. The aggregate emission reduction, calculated as 41,701 t CO₂ per year, is less than 60 kt CO₂ equivalent.	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/	OK	
B.1.4. Is the project in accordance to every other stipulation or requirement mentioned in all sections of the methodology?	The project is in accordance to every other stipulation or requirement. This was checked on the basis of the methodologies.	AMS-III.H/ /AMS-I.D/ /unfccc/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
B.2. Project Boundaries <i>Project Boundaries are the limits and borders defining the GHG emission reduction project</i>				
B.2.1. Are the project's spatial boundaries (geographical) clearly defined?	The chosen project boundaries, defined as the physical, geographical site where the waste water and sludge treatment takes place and as the physical, geographical site of the renewable generation source, could be confirmed during the site visit.	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/	OK	
B.2.2. Are all sources and GHGs included in the project boundary as required in the applied methodology?	All sources required in the applied methodology are included. Following sources are included/ excluded in the project boundary: $PE_{y,power}$: Emission from electricity consumption; Included as project activity consumes electricity $PE_{y,ww,treated}$: Emissions from degradable organic carbon in the treated wastewater; Included as the treated wastewater is treated in open lagoons $PE_{y,s, final}$: Emissions from anaerobic decay of final sludge produced; not included (please refer to B.2.3)	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
	$PE_{y, \text{ fugitive}}: PE_{y, \text{ fugitive, ww}} + PE_{y, \text{ fugitive, s}}$: Emissions from methane release in capture and utilization/combusting/flare system included as fugitive emissions can occur during the capturing and utilization Fugitive emissions through capture and utilization in the anaerobic sludge treatment not included (please refer to B.2.3). $PE_{y, \text{ dissolved}}$: Emissions from dissolved methane in treated wastewater; included as emission can occur from dissolved methane in treated wastewater. $PE_{y, \text{ upgrading}}$: Emissions related to the upgrading and compression of biogas Not included (please refer to B.2.3) $PE_{y, \text{ leakage, pipeline}}$: Emissions due to physical leakage from dedicated piped network Not included (please refer to B.2.3) All required GHGs are included in the boundary. The applied values are conservative and deemed to be appropriate for calculation.			
B.2.3. In case the methodology allows to choose whether a source and/or gas is to be included, is the choice sufficiently explained and	Following sources are not included: $PE_{y, s, \text{ final}}$: Emissions from anaerobic decay of final sludge	/Site visit/ /PDD/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
justified?	produced The final sludge will be used for start up purposes of other biogas plants. Furthermore during site visit no sludge disposal could be observed. $PE_{y, fugitive, s}$ Fugitive emissions through capture and utilization in the anaerobic sludge treatment See argument above. OK $PE_{y, upgrading}$: Emissions related to the upgrading and compression of biogas $PE_{y, leakage, pipeline}$: Emissions due to physical leakage from dedicated piped network Sources are not included as no upgrading of the biogas.	AMS-III.H/ /AMS-I.D/ /unfccc/		
B.3. Baseline Identification <i>The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.</i>				
B.3.1. What possible baseline scenarios have been considered?	According to the methodology AMS-III.H (version 9) the baseline is existing anaerobic wastewater treatment system without methane recovery for the case of introduction of a sequential anaerobic waste water treatment system with methane recovery.	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
	The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient.	/unfccc/		
B.3.2. Is the list of alternatives complete?	During site visit it could be confirmed that the baseline mentioned in B.3.1 is the only possible baseline scenario. For the project activity the wastewater is diverted from the starch factory to the project activity. After the treatment the wastewater is diverted to the open lagoons again and then discharged to the river. Other alternatives could be excluded.	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/	OK	
B.3.3. What has been identified as the baseline scenario?	The identified baseline is the treatment of the waste water in open lagoons. The wastewater of the starch production is diverted into open lagoons with no methane capture equipment. The treatment of the wastewater causes CH ₄ emissions which are emitted into the atmosphere. The baseline also includes grid connected renewable electricity generation. The baseline is the kWh produced by the renewable generating unit multiplied by the emission coefficient Thai grid.	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/	OK	
B.3.4. Has the baseline scenario been determined according to the methodology?	☒ The determination has been carried out as per the applied methodology. ☐ The following CARs / CLs have been identified with respect to the selection of the baseline scenario:	/PDD/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
		AMS-III.H/ /AMS-I.D/		
B.3.5. Has any plausible alternative scenario been excluded?	No plausible baseline scenario has been excluded.	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/	OK	
B.3.6. Has the baseline scenario been determined using conservative assumptions where possible?	The baseline scenario has been determined using conservative assumptions where possible. For baseline emission reduction the emission from degradable organic carbon is taken into account The Formula is as follows: $BE_{y,ww} = Q_{y,ww} \sum_{GWP_CH_4} COD_{y,removed,i} B_{o,ww} MCF_{ww,treatment,j}$ The amount of waste water assumed was crosschecked with the starch production. The applied COD values bases on an	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/ /DLL/ /SPR/ /CMC/ /WAR-FE/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
	own measurement campaign. These values were crosschecked with literature values as well starch project activities under CDM. These values are conservative and deemed to be appropriate for calculation. For calculation the lower $MCF_{ww,treatment,l}$ default value for anaerobic deep lagoon was used. The lagoon depth deeper than 2 m was confirmed. The applied values were crosschecked during site visit with the amount of biogas and electricity generated (scada system) and deemed to be conservative. The applied EF issued from the Bureau of Energy Research Department of Alternative Energy Development and Efficiency Ministry of Energy (http://www2.dede.go.th/cdm/520126_GridEmission2007.pdf) deemed to be appropriate and applicable to the project. The calculation of the EF based on latest data that were available at the time of PDD uploading. The set out calculation is verified and validity of all parameters is confirmed.	/Dede/		

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
B.3.7. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	According to the Thai regulation limits of COD concentration are required for the discharge of waste water from starch production. A special technology to achieve these limits is not required. These information bases on corresponded regulation.	/lr/	OK	
B.3.8. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	The baseline scenario determination is compatible with the available data and literature sources are clearly referenced. The PDD provides references to all relevant literature sources (sources were submitted for validation, too) and data.	/AMS.III.H/ /AMS.I.D/ /PDD/	OK	
B.4. Additionality Determination <i>The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.</i>				
B.4.1. Methodology				
B.4.1.1. Did the additionality justification follow the requirements of the applied methodology and/or methodological tools?	Since the project activity is a small scale project it must comply with requirements on additionality as set out in Attachment A of Appendix B of the simplified modalities and procedures for small-scale CDM project activities. AMS I.D. and AMS III.H. don't require additional elaborations on additionality. In accordance with Attachment A of Appendix B	/PDD/ /AAB/ /AMSIH-H/ /AMS.I-D/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
	of the simplified modalities and procedures for small-scale CDM project activities project's additionality is demonstrated using the investment analysis approach. The approach taken is hence in compliance with the requirements.			
B.4.2. Consideration of CDM before project start				
B.4.2.1. Is the project starting date reported in accordance with the CDM glossary of terms?	The starting date of the project activity is defined as the date of the date of 1 st purchase order for the foundation pile as of 20 th July 2006. The starting date as mentioned in the PDD has been cross checked with the purchase order ^{/SD/} and compared with the definition given in CDM glossary of terms. The starting date is deemed correct.	/SD/ /PDD/ /GT/	OK	
B.4.2.2. In case the project start date is before commencing of validation, was the incentive from the CDM seriously considered and are details given in the PDD?	The project start date is before commencing of validation. The project history is stated in section B.5 in an untransparent manner. Moreover, documents to support the management decision are pending for validation and confirmation of serious consideration of CDM is not yet possible. Project history was improved and Management decision is now evidenced with supporting documents.	/PDD/ /SD/	CAR B15 CL B11 CAR B1	OK
B.4.2.3. How and when was the decision to proceed with the project taken?	The decision to implement the project as a CDM project is not proved and further clarification is requested. Please refer to the comment above. The decision to proceed with the installation of the WWTP was taken by the Bangna board of directors in December 2005.	/PDD/ /SD/	CAR B15 CL B11 CAR B1	OK

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
B.4.2.4. Is the project start date consistent with the available evidences?	Evidences are pending and the relevant section in the PDD is not transparent enough in order to confirm the prior consideration of CDM. Please refer to checklist check list question B.4.2.2. Start date defined as "First payment being paid as consider as construction start" 20.07.06 evidenced and consistent with available evidences.	/PDD/ /SD/	CAR B15 CL B11 CAR B1	OK
B.4.2.5. Was the decision to proceed with the project taken by a person which has the authority to do so?	Decision has been taken by the board.	/PDD/ /MD/ /SD/	CAR B15 CL B11 CAR B1	OK
B.4.2.6. How was the CDM involved in the decision making process?	The project activity was discussed during board meetings. On the basis of feasibility study ^{/PPP/} the board of bangna starch agreed to implement the project with support of the CDM. Further steps in the decision making process and how the CDM was involved in the same are presented in section B.5 of the PDD. Respective information were validated and found correct taking into account stakeholder interviews and relevant supporting documents.	/PDD/ /MD/ /SD/	CAR B15 CL B11 CAR B1	OK
B.4.2.7. Can the CDM involvement in the decision assessed as serious?	Please refer to check list question B.4.2.6.	/PDD/ /MD/	CAR B15	OK

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
		/SD/ /PEA/	CL B11 CAR B1	
B.4.3. Identification of alternatives Step 1 (in case of SSC projects pl. skip steps 1 and 2)				
B.4.3.1. Have all realistic alternatives been identified to the project?	NA			
B.4.3.2. Contains the list of alternatives at least the status-quo situation and the project not undertaken as a CDM project?	NA			
B.4.3.3. Do all identified alternatives comply with applicable regulation?	NA			
B.4.4. Investment analysis Step 2 <i>In case the investment analysis as per step 2 is chosen to justify the additionality Annex 2 "Assessment of Financial Parameters" has to be used to provide additional details of the calculation parameters..</i>				

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
B.4.4.1. Is an appropriate analysis method chosen for the project (simple cost analysis, investment comparison analysis or benchmark analysis)?	In order to comply with the requirements of the CDM and GS the investment analysis has been chosen as method to demonstrate the project's additionality. The validity of analysis method can not be confirmed yet as contradictory information were obtained during the site visit. As per interviews with PPs the generated electricity is sold to the grid operator <i>Provincial Electricity Authority</i> (PEA). However, according to the BOOT contract electricity is sold to Bangna Starch company. Since information regarding electricity utilisation is insufficient CAR B12 and CAR B15 is raised for provision of further clarification necessary for validation. Additionally to the Draft BOOT contract^{/BOOT/} the final BOOT contract^{/BBOT-1/} has been submitted for validation. Information in BOOT contract^{/BBOT-1/} and gathered on-site / during follow up interviews are now consistent and respective CARs can be closed.	/PDD/ /FSR/ /ECI/ /EEI/	CAR B12 CAR B15	OK
B.4.4.2. Is a clear, viewable and unprotected Excel spreadsheet available for the investment calculation?	Yes, it is available. It is partially not self explanatory and two tables are in Thai and must be translated in English in order to perform validation.	/XLS-IRR/	CAR B14 CAR B15	OK
B.4.4.3. Does the period chosen for the investment analysis reflect the technical lifetime of the project activity 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	The technical lifetime as per PDD is 30 years and the period chosen for calculating the financial indicator (IRR) is 12 years excluding duration of construction. This is not contradictory or unacceptable as the project's assets (biogas reactor, biogas handling system etc.) are owned by the PP only for 12 years. After the 12 years operation period these assets will be	/XLS-IRR/ /PDD/ /IM/ /BOOT/	CAR B12 CAR B14 CAR	OK

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
inflow) included?	transferred from P&Papop to Bagna Starch according to the BOOT contract. However, contradictory information w.r.t. electricity utilisation was obtained during the site visit and review of BOOT contract, leading to CAR B12. Clarification on inconsistencies between BOOT contract and interviews / PDD shall be provided before final assessment of this question. Additionally to the Draft BOOT contract ^{/BOOT/} the final BOOT contract ^{/BOOT-1/} has been submitted for validation. Information in BOOT contract ^{/BOOT-1/} and gathered on-site / during follow up interviews are now consistent and respective CARs can be closed.	/BOOT-1/	B15 CAR B16 CAR 17	
B.4.4.4. Is the fair value calculated in accordance with local accounting regulations (where available) or international best practice?	No fair value will remain for the investor P&Papop after the 12 years period. According to Thai "Royal Decree by Revenue Code #145/1984" the annual depreciation of assets is 20% and therefore 100% of the investment is depreciated after a five years period.	/TAS/ /XLS-IRR/ /PDD/	OK	OK
B.4.4.5. Is the book value as well as the expectation of the potential profit or loss included in the fair value calculation?	Please refer to checklist item above.	/TAS/ /XLS-IRR/ /PDD/	OK	OK
B.4.4.6. Are depreciation and other non-cash related items added back to net profits for the purpose to calculate the financial	Depreciation or other non-cash items have not been considered in the investment calculation. The IRR calculation is based on cash inflows and cash outflows only.	/XLS-IRR/ /PDD/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
indicator?				
B.4.4.7. Is taxation excluded in the investment analysis or is the benchmark intended for post tax comparisons?	Taxation is considered as an expense in the IRR calculation for the initial investment. Hence, clarification / corrective action requests were expressed in CAR B14 and CAR B16. CARs are successfully closed.	/XLS-IRR/ /PDD/ /GIA/	CAR B14 CAR B16	OK
B.4.4.8. Were the input values used in the investment analysis valid and applicable at the time of the investment decision?	Validity of input values (at the time of investment decision) cannot be confirmed yet. This is due to lack of information in PDD, lack of supporting documents and inconsistencies between input values in IRR calculation, PDD and evidences provided. The IRR calculation has been revised and is now deemed adequate to meet the requirements as set out in respective CARs and EB guidance in EB 39, Annex 10.	/PDD/ /XLS-IRR/ /GIA/	CAR B11 CAR B12 CAR B14 CAR B15 CAR B16 CAR B17	OK
B.4.4.9. In case of project IRR: Are the costs of financing expenditures (loan repayments and interests) excluded from the calculation of project IRR?	The project activity demonstrates the additionality by calculating the project IRR. Costs of financing are not included in this calculation.	/XLS-IRR/ /GIA/ /PDD/	OK	OK
B.4.4.10. In case of equity IRR: Is the part of the investment costs, which is financed by equity considered as net cash outflow and	NA	/XLS-IRR/ /GIA/	OK	OK

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
is the part financed by debt excluded in net cash outflow?		/PDD/		
B.4.4.11. 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)?	The chosen benchmark is a Thai commercial lending rate, i.e. the Minimum Lending Rate (MLR). This may be in compliance with /GIA/ and /AT/ and appropriate for the financial indicator (project IRR) provided the PP can further elaborate the appropriateness of the MLR as benchmark value. The benchmark value has been further explained and discussed with the PP during site visit. Further investigation revealed that this value is comparatively low considering other dates at the time of taking the investment decision.	/AAB/ /GIA/ /XLS-IRR/	CAR B12 – CAR B17	OK
B.4.4.12. Is the benchmark value suitable for the project activity?	Please refer to checklist item above.	/AAB/ /GIA/ /XLS-IRR/	CAR B12 – CAR B17	OK
B.4.4.13. Is it ensured that the project cannot be developed by other developers than the PP?	The project activity can be undertaken by other developers than P&Papop. Since the MLR is used as benchmark this checklist question is not applicable.	/AT/ /GIA/	OK	OK
B.4.4.14. Was the benchmark consistently used in the past for similar projects with similar risks?	NA			
B.4.5. Barrier analysis Step 3 or SSC additionality assessment				

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
B.4.5.1. Are there any barriers given which have a clear and definable impact on the profitability of the project?	Investment analysis approach is used. Please refer to checklist items B.4.4 above.			
B.4.5.2. How is it justified and evidenced that the barriers given in the PDD are real?	Please refer to checklist items B.4.4 above.			
B.4.5.3. How is it justified that one or a set of real barriers prevent(s) the implementation of the project activity?	Please refer to checklist items B.4.4 above.			
B.4.6. Common practice analysis Step 4 (in case of SSC projects skip this step)				
B.4.6.1. Is the defined region for the common practice analysis appropriate for the technology/industry type?	NA			
B.4.6.2. To what extent similar projects have been undertaken in the relevant region?	NA			
B.4.6.3. In case similar projects are identified, are there any key differences between the proposed project and existing or ongoing projects and what kind of differences are observed?	NA			

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
B.5. Ex-Ante Calculation of GHG Emission Reductions <i>It is assessed whether the ex-ante calculations of project emissions, baseline emissions, leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified. Furthermore calculation of emission reductions shall be assessed.</i>				
B.5.1. Are the equations applied correctly according to the applied approved methodology?	☒ The equations applied for calculation are correctly applied according to the approved methodology. Please refer to B.2.2, B.2.3, B.3.6.	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/ /DLL/ /SPR/ /CMC/ /WAR-FE/ /Dede/		OK
B.5.2. In case the methodology allows for different methodological choices, are the equations applied properly justified and have they been	Please refer to B.2.2, B.2.3, B.3.6.	/Site visit/ /PDD/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
used reflecting the other methodological choices (i.e. baseline identification)?		AMS-III.H/ /AMS-I.D/ /unfccc/ /DLL/ /SPR/ /CMC/ /WAR-FE/ /Dede/		
B.5.3. Have conservative assumptions been used when calculating the project emissions?	MCF higher values were applied; Please also refer to B.2.2, B.2.3, B.3.6.	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/ /DLL/ /SPR/ /CMC/ /WAR-FE/ /Dede/	OK	
B.5.4. Are all data and parameters which remain fixed throughout the crediting period correct,	The applied EF issued from the Bureau of Energy Research Department of Alternative Energy Development and	/Site visit/		

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
applicable to the project and will lead to a conservative estimation of emission reductions?	Efficiency Ministry of Energy (http://www2.dede.go.th/cdm/520126_GridEmission2007.pdf) deemed to be appropriate and applicable to the project. The calculation of the EF based on latest data that were available at the time of PDD uploading. Please also refer to B.2.2, B.2.3, B.3.6 and B.5.5.	/PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/ /DLL/ /SPR/ /CMC/ /WAR-FE/ /Dede/		
B.5.5. Are all ex-ante calculation values for monitoring parameters (as defined as per chapter B.7.1) reasonable?	☒ All "Values of data to be applied for the purpose of calculating expected emissions reductions" are considered to be reasonable, applicable and conservative. During site visit values for ex-ante calculation were crosschecked with data from Scada system. It can be confirmed that the applied values for ex-ante calculation is reasonable and conservative.	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/ /DLL/ /SPR/ /CMC/ /WAR-FE/ /Dede/		

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
B.5.6. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	The emission reductions are real, measurable and give longterm benefits related to the mitigation of climate change. In the course of validation of the baseline determination, monitoring approach, ER calculation including respective input values have been reviewed. Though the overall mitigation of climate change due to real emission reduction can be determined doubtless. Please also refer to B.5.5.	/Site visit/ /PDD/ AMS-III.H/ /AMS-I.D/ /unfccc/ /DLL/ /SPR/ /CMC/ /WAR-FE/ /Dede/		
B.6. Monitoring of Emission Reductions <i>It is assessed whether the monitoring plan is appropriate for the project activity and in line with the applied methodology.</i>				
B.6.1. Are all monitoring parameters required by the applied methodology contained in the monitoring plan?	The monitoring parameters are identified as follows: Amount of electricity used and produced; Degradable carbon content of the wastewater before and after the treatment; The flow of wastewater; The amount of biogas produced, send to gen-sets and closed flare, CH4 content of the biogas, temperature of the flare. Measurement could be verified during site visit.	/PDD/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
	Amount of final sludge generated also mentioned in monitoring section.			
B.6.2. Are the means of monitoring of all parameters contained in the monitoring plan in accordance with the requirements of the applied methodology?	The monitoring parameter contained in the monitoring plan is in accordance with the requirements of the applied methodologies. Name, data unit, description, source of data, measurement equipment, monitoring frequency and QA/QC procedures are appropriately described. Please refer to CL B7 and CL B8. CLs successfully closed.	/site visit/ /AMS-III.H/ /AMS-I.D/ /unfccc/	CL B7 CL B8	OK
B.6.3. Have all equations necessary for ex-post emission reduction calculation been described clearly and in line with the methodology?	The ex-post emission reduction calculation based on the amount of methane recovered and flared. The project emissions will be deducted from the emission reductions calculated.	/AMS-III.H/ /AMS-I.D/ /unfccc/	OK	

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
B.6.4. Is it likely that the monitoring arrangements described in the PDD can properly be implemented in the context of the project activity?	During site visit it could be observed the monitoring arrangements described in the PDD were implemented.	/AMS-III.H/ /AMS-I.D/ /unfccc/	OK	
B.6.5. Are the QA/QC procedures appropriate sufficient to ensure the emission reductions achieved from the project activity can be reported ex-post and verified?	Please refer to CAR B5. CAR B5 closed Monitoring plan improved regarding back up metering. As a result of the site visit it can be concluded that emission reduction achieved from the project can be reported ex-post and verified.	/Site visit/ /AMS-III.H/ /AMS-I.D/ /unfccc/	CAR B5	OK
B.6.6. Are procedures identified for data management?	According to the PDD all relevant data is stored electronically with the process. As SCADA system is installed relevant data are stored electronically. Log sheet used for COD measurements are transferred into digital storage medium.	/Scada/	OK	



Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
C. Duration of the Project/ Crediting Period <i>It is assessed whether the temporary boundaries of the project are clearly defined.</i>				

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
C.1. Is the project's starting date clearly defined and evidenced?	Please refer to Finding B9. OK, starting date is defined as 20/7/2006 the purchase order of the pile.		CAR B9	OK
C.2. Is the project's operational lifetime clearly defined and evidenced?	The operational lifetime is defined as 30 years, but for investment analysis the BOOT agreement is used as the lifetime basis. Therefore lifetime defined as 30 years not important.	/BOOT/ /BOOT-1/	OK	
C.3. Is the start of the crediting period clearly defined and reasonable?	Please refer to CL C1. Starting date defined as 01/08/2009 is reasonable.	/PDD/	CL C1	OK
D. Environmental Impacts <i>Documentation on the analysis of the environmental</i>				

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
<i>impacts will be assessed, and if deemed significant, an EIA should be provided to the DOE.</i>				
D.1.1. Are there any Host Party requirements for an Environmental Impact Assessment (EIA)?	According to the regulation National Environmental Quality Act B.E. no EIA is required. Regarding electricity generation an EIA is required up to 10 MW capacity.	/ir/	OK	
D.1.2. In case an Environmental Impact Assessment (EIA) is requested by the host party, has it been carried out and if applicable duly approved?	EIA not required.	/ir/	OK	
D.1.3. Has an analysis of the environmental impacts of the project activity been sufficiently described and in line with the host party environmental legislation?	Please refer to D.1.1. An Initial Environmental Evaluation (IEE) was conducted. Here no environmental impacts of the project activity are described.	/IEE/	OK	
D.1.4. Are transboundary environmental impacts considered in the analysis?	No transboundary environmental impacts considered as not applicable.		OK	
E. Stakeholder Comments <i>The DOE should ensure that stakeholder comments</i>				

Checklist Item (incl. guidance for the validation team)	Validation Team Comments (Means and results of assessment)	Ref.	Draft Concl.	Final Concl.
<i>have been invited with appropriate media and that due account has been taken of any comments received.</i>				
E.1. Have relevant local stakeholders been invited to consultation prior to the publication of the PDD?	Local stakeholders (government representatives, local officials, NGOs, academic institutions) have been invited before publishing the PDD. However, Gold Standard requirements on invitees are not met, yet.	/ISCR/ /IM03/	OK	
E.2. Can the local stakeholder consultation process be assessed as adequate?	A public consultation event (based on Gold Standard stakeholder consultation criteria) was held on July 25, 2007 at Rimpao Hotel, Kalasin Province. No critical comments by attendances were received during the above mentioned stakeholder process.	/ISCR/ /IM03/	OK	

ANNEX 2: ASSESSMENT OF BASELINE IDENTIFICATION

Table A-2: Assessment of Baseline Identification

☐	Baseline is not identified
☒	Assessment of baseline see below

Baseline Alternatives identified	Inline with the Methodology?	Eliminated	Reasons for elimination / non-elimination from list of alternatives	Evidence used	DOE Assessment	
					Appropriateness of elimination	Assessment of validation team (results and means of assessment)
The existing aerobic wastewater or sludge treatment system, in the case of substitution of one or both of these systems for anaerobic ones with methane recovery and combustion	☒	☒	No aerobic wastewater treatment respectively sludge treatment.	/AMS-III.H/ Site visit	☒	During site visit it was observed that the wastewater was treated in open lagoons. No sludge or aerobic wastewater treatment could be observed.
The existing sludge disposal system, in the case of introduction of anaerobic sludge treatment system with methane recovery and combustion to an existing wastewater treatment plant;	☒	☒	No sludge treatment.	/AMS-III.H/ Site visit	☒	During site visit it was observed that the wastewater was treated in open lagoons. No sludge or aerobic wastewater treatment could be observed.

The existing sludge treatment system without methane recovery and combustion;	☒	☒	No sludge treatment.	/AMS-III.H/ Site visit	☒	During site visit it was observed that the wastewater was treated in open lagoons. No sludge or aerobic wastewater treatment could be observed.
The existing anaerobic wastewater treatment system without methane recovery and combustion;	☒	☒	Please see identified baseline as the project activity introduce a sequential anaerobic wastewater treatment step.	/AMS-III.H/ Site visit	☒	The project activity implemented an UASB reactor.
The untreated wastewater being discharged into sea, river, lake, stagnant sewer or flowing sewer, in the case of introducing the anaerobic treatment to an untreated wastewater stream;	☒	☒	Anaerobic treatment step was implemented before the project activity.	/AMS-III.H/ Site visit	☒	During site visit it was observed that the wastewater was treated in open lagoons. No sludge or aerobic wastewater treatment could be observed.
According to the methodology AMS-III.H (version 9) the baseline is existing anaerobic wastewater treatment system without methane recovery for the case of introduction of a sequential anaerobic waste water treatment system with methane recovery. The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient.	☒	☐	Plausible. This is the common practice for the Tapioca industry.	/AMS-III.H/ Site visit	☒	There is no regulations and policy to capture methane from the effluent discharge. No electricity generation as the methane captured is used for electricity generation. Therefore, the produced electricity by the project activity displaces electricity from the national grid.

ANNEX 3: ASSESSMENT OF FINANCIAL PARAMETERS

Table A-3: Assessment of Financial Parameters

☐	No financial parameters are used for additionality justification						
☒	Assessment of all financial parameters see below						
Parameter	Value applied	Unit	Source of Information (please indicate document and page)	Reference	DOE ASSESSMENT		
					Correctness of value applied	Appropriateness of information source	Comment
Investment	124.424	Mio THB	Contract for Flare system, P&Papop proposal, Bill of Loading Gas Engine, Supply Contract Gas Engine, Sample Offer Biogas Plant P&Papop.	/POFS/ /PPP/ /BLGE/ /SCGE/ /SOBP/	☒	☒	
VAT	7	%	Thai governmental Revenue Department	/tgrd/	☒	☒	
Operating days	225	days	Portfolio of CDM Project Bagna Starch	/PCP/ /SPR/	☒	☒	Cross checked with starch production records.
Biogas production	4.490.192	m3/year	Calculated	-	☒	☒	Cross checked with SCADA values.
Electricity production rate	2.35	kWh/m3 biogas	SCADA system	/SCADA/	☒	☒	Calculation adequate, cross checks with current values from SCADA system.

Energy production	7,555,196	kWh/y	calculated	-	☒	☒	Calculation adequate, cross checks with current values from SCADA system.
Electricity price + adder (excl. VAT)	2.8	Bath/kWh	Calculated average price based on prices from PEA. Invoices and other supporting documents have been provided.	/ECEI/ /PEA/	☒	☒	Further justification necessary. Price increase rate is now considered.
Operating cost	648,000	Baht/year	P&Papop proposal	/PPP/	☒	☒	Equipment has been checked on site and is in line with /PPP/.
Maintenance cost	1,439,002	Baht/year	P&Papop proposal	/PPP/	☒	☒	Equipment has been checked on site and is in line with /PPP/.
Chemical cost	300,000	Baht/year	P&Papop proposal	/PPP/	☒	☒	
Wage and salary	1,086,000	Baht/year	P&Papop proposal	/PPP/ /XLS-IRR/	☒	☒	Included in O&M costs.
Internal Electricity consumption in gas engine	0.065	Bath/kWh	P&Papop proposal	/PPP/	☒	☒	
Maintenance cost for gas engine including overhaul	0.350	Bath/kWh	Estimation by generators manufacturer (GUASCOR)	/SCGE/	☒	☒	
Minimum Lending Rate	6.56	%	Average percentage of registered banks of Thailand.	/bot/	☒	☒	Percentage is conservative compared with other dates at time of taking the investment decision; for instance July 2006 (7.8%).
Inflation rate	5.9	%	Thai Ministry of Commerce	-	☒	☒	Value is taken from an public source at the time of taking the investment decision.
Operation period	12	years	BOOT contract	/BOOT/	☒	☒	
Wastewater production	850,000	m ³ /yr	Estimated	-	☒	☒	Cross check of SCADA: 270,000m ³ since installation. Cross check of Flow Meter 1 (FM1): 232,527m ³ since installation. The amount of waste water assumed was crosschecked with

							the starch production and deemed OK.
Influent COD	16.26	kg COD/m ³	Wastewater Analysis Report from Environmental Engineering Laboratory of Faculty of Engineering	/WAR-FE/	☒	☒	
COD removed	14.63	kg COD/m ³	Calculated, 90% of COD removed.	-	☒	☐	The applied COD values bases on an own measurement campaign. These values were crosschecked with literature values as well starch project activities under CDM. These values are conservative and deemed to be appropriate for calculation.
Bo, ww	0.21	kg CH ₄ /kg COD	AMS.III.H, vers. 9	/AMSIH-H/	☒	☒	
MCFuasb	0.8	fraction	AMS.III.H, vers. 9	/AMSIH-H/	☒	☒	
Methane content in biogas	65	%	estimated	-	☒	☒	Value is deemed appropriate. Cross checked during site visit with SCADA system.

ANNEX 4: ASSESSMENT OF BARRIER ANALYSIS

Table A-4: Assessment of Barrier Analysis

☐		No barrier parameters are used for additionality justification		
☒		Assessment of barriers see below		
Kind of Barrier (invest, tech, other)	Description of Barrier	Evidence used	Assessment of validation team	
			Appropriateness of information source	Explanation of final result
Investment	The project participant selected the investment barrier to demonstrate that the project is additional.	PDD/ /XLS-IRR/ /GIA/ PDD/ /FSR/ /ECI/ /EEI/	☒	In the course of validating parameters used in the IRR calculation supporting documents provided by the PP have been utilised and relevant background information such as public available sources are taken into account as well. After closure of respective CARs / CLs the validation team arrived at the conclusion that the assumptions and computations in the IRR spreadsheet are in line with the supporting documents provided by the PP. Thus, the validity of IRR calculation can be confirmed. The calculation of the financial indicator (project IRR) reflecting the project's feasibility in financial terms has demonstrated its additionality when comparing the IRR of 5.24% with the benchmark value – Minimum Lending Rate (MLR) of 6.56%. Moreover, the sensitivity analysis revealed that the variation of key financial parameters substantiate project's additionality as the benchmark is still not crossed except in case the investment costs decrease by 10%. However, meeting the benchmark by 10% reduction of investment cost is an unlikely event as observed during the site visit. Actual values further substantiate the unlikelihood of a 10% decrease of investment costs. For a detailed assessment on financial parameters please refer to Annex 3; Furthermore the applied benchmark value – Thai Minimum Lending Rate (MLR) – has been further explained and discussed with the PP during site visit. Investigations on its conservativeness revealed that this value is comparatively low considering other dates at the time of taking the investment decision.

ANNEX 5: OUTCOME OF THE GSCP

Table A-5: Outcome of the Global Stakeholder Consultation Process

☒	No comments were received during the global stakeholder consultation period					
☐	Comments were received during the global stakeholder consultation period. The comments (in unedited form) and the consideration/response of the validation team are presented below:					
Com ment No.:	Comment by:	Inserted on:	Subject	Comment ^{*)}	Response validation team ^{*)}	Conclusion (incl. CARs CLs or FARs)

^{*)} In case clarifications have been requested by the validation team corresponding rows shall be added

ANNEX 6: APPOINTMENT CERTIFICATES OF TEAM MEMBERS



CERTIFICATE OF APPOINTMENT

Mr. Dr. Jochen Schubert

born on 1970-12-24

satisfies the requirements as specified in the TÜV NORD
JI/CDM CP directives and is hereby appointed as

TÜV NORD JI/CDM Expert

For the following scopes: 1, 2, 3, 6, 7, 13, 15

The present appointment will terminate on 2011-07-22

Certification registration No. 08 07 02 - 56

Essen, 2008-07-23


Head of TÜV NORD JI/CDM Certification Program
of TÜV NORD CERT GmbH



CERTIFICATE OF APPOINTMENT

Mr. Dipl.-Ing. Rainer Winter

born on 1963-02-21

satisfies the requirements as specified in the TÜV NORD
JI/CDM CP directives and is hereby appointed as

TÜV NORD JI/CDM Senior Assessor

The present appointment will terminate on 2010-07-05

Certification registration No. 04 02 154-03

Essen, 2007-07-06


Deputy of TÜV NORD JI/CDM Certification Program
of TÜV NORD CERT GmbH



CERTIFICATE OF APPOINTMENT

Mr. Dipl.-Ing. Eric Krupp

born on 1971-06-25

satisfies the requirements as specified in the TÜV NORD
JI/CDM CP directives and is hereby appointed as

TÜV NORD JI/CDM Senior Assessor

The present appointment will terminate on 2010-07-05

Certification registration No. 06 05 01 - 017

Essen, 2007-07-06

A handwritten signature in black ink, appearing to be "Eric Krupp".

Head of TÜV NORD JI/CDM Certification Program
of TÜV NORD CERT GmbH