



RINA

# VALIDATION REPORT


**Si Final**


“Double A Ethanol wastewater treatment plant”  
in  
Thailand

Report N° 2012-IQ-48-MD

Revision N° 1.2

# VALIDATION REPORT

<b>Project Title:</b> Double A Ethanol wastewater treatment plant		<b>Country:</b> Thailand	<b>Estimated CERs (tCO<sub>2</sub>e):</b> 170,983 annual average	
<b>Client:</b> Climate Change Capital Ltd.		<b>Client contact:</b> Martha Fernandez		
<b>Report No.:</b> 2012-IQ-MD-48		<b>Revision:</b> 1.2	<b>Date of this report:</b> 12/12/2012	
<b>Approved by (Decision Maker):</b>  Roberto Cavanna			<b>Date of approval:</b> 29/12/2012	
<b>Methodology</b>				
<b>Number:</b> ACM0014	<b>Version:</b> 05.0.0 of 20/07/2012	<b>Title:</b> Treatment of wastewater	<b>Scale</b> Large	<b>SS(s):</b> 13
<p>RINA Services S.p.A. (RINA), commissioned by Climate Change Capital Ltd., has performed the validation of the project activity "Double A Ethanol wastewater treatment plant" in Thailand, with regard to the relevant requirements for CDM activities.</p> <p>In conclusion, it is RINA's opinion that the project activity "Double A Ethanol wastewater treatment plant", in "Thailand", as described in the PDD version 03.1 of 27/12/2012, meets all relevant requirements for CDM activities and all relevant host Party criteria and correctly applies the baseline and monitoring methodology "ACM0014", "Treatment of wastewater", version 05.0.0 of 20/07/2012. Hence, RINA requests the registration of the project as a CDM project activity.</p>				

<b>Work carried out by:</b> Rekha Menon Champok Buragohain Praveen K. Kumar Karthika Varma	<input checked="" type="checkbox"/> No distribution without permission from the Client or organizational unit responsible <input type="checkbox"/> Strictly confidential <input type="checkbox"/> Unrestricted distribution
<b>Work verified by (AO Authorized office signing for the DOE)</b>  Laura Severino	<b>Keywords:</b> Climate Change, Kyoto Protocol, Clean Development Mechanism, Validation

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## Abbreviations

BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM M&P	Modalities and Procedures CDM
CDM-PCP	Clean Development Mechanism Project Cycle Procedure
CDM-PS	Clean Development Mechanism Project Standard
CDM-VVS	Clean Development Mechanism Validation and Verification Standard
CER(s)	Certified Emission Reduction(s)
CH <sub>4</sub>	Methane
CL	Clarification Request
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
CRT	Coordination and Technical Control Staff
DCI	Certification Division of RINA Services Spa
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EIA	Environmental Impact assessment
EPC	Engineering, Procurement and Construction
ER	Emission Reductions
FAR	Forward Action Request
FO	Fuel Oil
GHG(s)	Greenhouse gas(es)
GWP	Global Warming Potential
GPS	Global Positioning System
HCA	Host Country Approval
IC	Internal Circulation
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of Approval
MoV	Means of Verification
MOC	Modalities of Communication Statement
MP	Monitoring Plan
MR	Monitoring Report
NGO	Non-governmental Organization
NPV	Net Present Value
ODA	Official Development Assistance
O & M	Operation & Maintenance
PAM	Polyacrylamide
PDD	Project Design Document
PE	Project Emission
PEA	Provincial Electricity Authority

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PP(s)	Project Participant(s)
PWA	Provincial Waterworks Authority
Ref.	Document Reference
RINA	RINA Services Spa
SAR	Sequential Anaerobic Reactor
SS(s)	Sectoral Scope(s)
THB	Thai Baht
UNFCCC	United Nations Framework Convention on Climate Change
UASB	Upflow anaerobic sludge blanket

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# VALIDATION REPORT

## 1 INTRODUCTION

Climate Change Capital Ltd. has commissioned RINA to carry out the validation of the “Double A Ethanol wastewater treatment plant” project in Thailand.

This report summarizes the findings of the validation of the project, performed on the basis of UNFCCC criteria for CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting.

### 1.1 Objective

The objective of the Validation is to have an independent evaluation of a project activity by a designated operational entity against the requirements of the CDM as set out in decision 3/CMP.1, its annex and relevant decisions of the COP/MOP, on the basis of the project design document. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC requirements and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

### 1.2 Scope

The validation scope is to review the PDD against the UNFCCC criteria for CDM.

UNFCCC criteria for CDM refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board.

Validation is not meant to provide any consultancy towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

## 2 METHODOLOGY

Validation was conducted using RINA procedures in line with the requirements specified in the CDM M&P, the latest version of the CDM Validation and Verification Standard, and relevant decisions of the COP/MOP and the CDM EB and applying standard auditing techniques.

The validation consisted of the following three phases:

- Document review;
- Follow-up actions;
- The resolution of outstanding issues and the issuance of the final validation report.

The following sections outline each step in more detail.

### 2.1 Document Review

The PDD, version 03.1 of 27/12/2012, version 03 of 10/12/2012 and previous versions 02 of 07/11/2012 and 01 of 01/08/2012 **/01/**, in particular the applicability of the methodology, the baseline determination, the additionality of the project activity, the starting date of the project, the monitoring plan, the emission reduction calculations provided in the form of a spreadsheet (AAe\_ER\_v.1) version 01 submitted on 10/09/2012, version 02 (AAe\_ER\_version 2\_07.11.2012) of 07/11/2012 and version 03 (AAe\_ER\_version 3\_12.12.2012) of 12/12/2012 **/02/**, the financial analysis spreadsheet (NPV\_AAe project\_Version 1) version 01 submitted on 17/09/2012, version 02 (NPV\_AAe project\_Version 2\_07.11.2012) of 07/11/2012 and version 03 (NPV\_AAe project\_Version 3\_12.12.2012) of 12/12/2012 **/03/** and additional documents /04/ - /76/ were assessed as part of the validation.

The following table lists the documentation that was reviewed during the validation.

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/01/	Climate Change Capital Ltd.: CDM-PDD for project activity “Double A Ethanol wastewater treatment plant” in Thailand, version 01 of 01/08/2012, version 02 of 07/11/2012 and version 03 of 10/12/2012, version 03.1 of 27/12/2012.
/02/	Climate Change Capital Ltd.: Emission Reduction Calculation Sheet version 01 (AAe_ER_v.1) submitted on 10/09/2012, version 02 (AAe_ER_version 2_07.11.2012) of 07/11/2012 and version 03 (AAe_ER_version 3_12.12.2012) of 10/12/2012.
/03/	Climate Change Capital Ltd.: Financial analysis spreadsheet version 01 (NPV_AAe project_Version 1) submitted on 17/09/2012, version 02 (NPV_AAe project_Version 2_07.11.2012) of 07/11/2012 and version 03 (NPV_AAe project_Version 3_12.12.2012) of 10/12/2012.
/04/	CDM Executive Board: Clean Development Mechanism Project Cycle Procedure, version 02.0, Annex 64, EB66 of 02/03/2012
/05/	CDM Executive Board: Clean Development Mechanism Project Standard, version 01.0, Annex 5, EB65 of 25/11/2011
/06/	CDM Executive Board: Clean Development Mechanism Validation and Verification Standard, version 02.0, Annex 4, EB65 of 25/11/2011
/07/	CDM Executive Board: Approved consolidated baseline and monitoring methodology “ACM0014”, “treatment of wastewater”, version 05.0.0 of 20/07/2012
/08/	CDM Executive Board: “Guidelines for completing the project design document form” version 01.0 dated 02/03/2012, Annex 8 of EB 66.
/09/	CDM Executive Board: Methodological “tool for the demonstration and assessment of additionality”, version 06.1.0 dated 13/09/2012 Annex 20 of EB 69
/10/	CDM Executive Board: Methodological “tool to calculate the emission factor for an electricity system”, version 02.2.1 dated 29/09/2011, Annex 19 of EB 63
/11/	CDM Executive Board: Glossary of CDM terms, version 06.0, Annex 63, EB 66 dated 02/03/2012
/12/	UNFCCC: Status of ratification of the Kyoto Protocol, website “ <a href="http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php">http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php</a> ” in English language retrieved on 02/10/2012
/13/	UNFCCC: Website indicating the list of DNAs “ <a href="http://cdm.unfccc.int/DNA/index.html">http://cdm.unfccc.int/DNA/index.html</a> ” in English language retrieved on 02/10/2012
/14/	CDM-Executive Board: Project Design Document Form for CDM Project Activities (F-CDM-PDD) version 04.1 dated 11/04/2012
/15/	M/s Double A Ethanol Company Limited: The minutes of the Board of Director’s meeting (Meeting No. 02/2007) dated 06/02/2007, Meeting No. 10/2007 dated 19/11/2007 and Meeting No.7/2009 dated 10/07/2009
/16/	Contract (No. <b>AGT007/2550</b> ) for supply of process equipment between Siemens Limited Thailand and Double A Ethanol Company Limited dated 24/12/2007
/17/	Contract (No. <b>AGT009/2550</b> ) for turnkey installation of process equipment between Siemens Limited Thailand and Double A Ethanol Company Limited dated 24/12/2007
/18/	Contract Revision No. 1 (contract no. <b>AGT007/2550</b> ) for supply of process equipment between Siemens Limited Thailand and Double A Ethanol Company Limited dated 27/08/2010
/19/	Contract Revision No. 1 (contract no. <b>AGT008/2550</b> ) for supply of process equipment between Siemens Limited Thailand and Double A Ethanol Company Limited dated 27/08/2010
/20/	Contract Revision No.1 (contract no. <b>AGT009/2550</b> ) for turnkey installation of process equipment between Siemens Limited Thailand and Double A Ethanol Company Limited dated 27/08/2010
/21/	Contract Revision No. 2 (contract no. <b>AGT007/2550</b> ) for supply of process equipment between Siemens Limited Thailand and Double A Ethanol Company Limited dated 28/02/2011
/22/	Contract Revision No. 2 (contract no. <b>AGT008/2550</b> ) for supply of process equipment between Siemens Limited Thailand and Double A Ethanol Company Limited dated 28/02/2011

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/23/	Contract Revision No.2 (contract no. <b>AGT009/2550</b> ) for turnkey installation of process equipment between Siemens Limited Thailand and Double A Ethanol Company Limited dated 28/02/2011
/24/	Siemens Limited Thailand: Proposal for wastewater treatment plant to Double A Ethanol Company Limited dated 05/10/2007
/25/	Namsai 304 Company Limited: Project design wastewater treatment in the ethanol producing plant with the capacity of 5,000 m <sup>3</sup> /day dated 26/09/2007
/26/	Siemens Limited Thailand: Design Calculation sheet (process calculation and mass balance) for wastewater treatment (biogas) plant by Double A Ethanol Company Ltd. dated 16/05/2011
/27/	Double A Ethanol Company Limited: Local newspaper advertisement for stakeholder meeting on 23/05/2008, list of participants in the stakeholder meeting, Minutes of the stakeholder meeting, feedback forms received from participants and photographs of the stakeholder meeting dated 23/05/2008.
/28/	Climate Change Capital Limited: Framework agreement signed between Climate Change Capital Limited and RINA Service Spa dated 23/06/2011 and further work order for validation of "Double A Ethanol wastewater treatment plant" project issued to RINA dated 16/07/2012.
/29/	CDM-Executive Board: Modalities of communication statement (F-CDM-MOC), version 02.1 dated 16/03/2012
/30/	CDM Executive Board: "Guidelines on the assessment of investment analysis", version 05, annex 5, EB 62 dated 15/07/2011
/31/	CDM Executive Board: "Guidelines for the reporting and validation of plant load factors" version 01 annex 11 of EB 48 dated 17/07/ 2009.
/33/	CDM Executive Board: Methodological tool 'Project emissions from flaring' version 02.0.0, EB 68, annex 15 dated 20/07/2012
/34/	CDM Executive Board: Methodological tool 'Project and leakage emissions from anaerobic digesters' version 01.0.0, EB 66, annex 32 dated 02/03/2012
/35/	CDM Executive Board: Methodological tool 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' version 02.0.0, EB 61, annex 11 dated 03/06/2011
/36/	CDM Executive Board: Methodological tool 'Tool to calculate project or leakage CO <sub>2</sub> emissions from fossil fuel combustion' version 02.0.0, EB 41, annex 11 dated 02/08/2011
/38/	CDM Executive Board: Methodological tool 'Tool to calculate baseline, project and/or leakage emissions from electricity consumption' version 01, EB 39, annex 7 dated 16/05/2008
/39/	CDM Executive Board: Guidelines on common practice, version 02.0 EB 69, Annex 8 dated 13/09/2011
/40/	Ministry of Energy, Thailand: Ethanol Plants in Thailand, website " <a href="http://www.dede.go.th/dede/images/stories/english/information/ethanolplants-jan10.pdf">http://www.dede.go.th/dede/images/stories/english/information/ethanolplants-jan10.pdf</a> " in English language retrieved on 04/10/2012
/41/	Ministry of Natural Resources and Environment; Kingdom of Thailand: Host country approval issued to "Double A Ethanol Company Limited" for the project "Double A Ethanol Wastewater treatment plant" dated 18/10/2012
/42/	Environment Agency; United Kingdom: Letter of approval issued to "Climate Change Capital Limited" for the project "Double A Ethanol Wastewater treatment plant" dated 26/11/2012
/43/	Government Savings Bank; Bangkok: Extract of bank loan agreement between Government Savings Bank and Double A Ethanol Company Limited dated 08/12/2011 and further declaration from Double A Ethanol Company Limited about the loan status dated 28/11/2012. .
/44/	Climate Change Capital Limited: Modalities of Communication statement (F-CDM-MOC) dated 06/12/2012
/45/	Climate Change Capital: Authorized signatory list for Climate Change Capital Limited (CCCL) for CDM transaction dated 18/05/2011 and declaration letter from Human Resource department stating employment status with CCCL dated 03/12/2012.
/46/	Department of Revenue, Thailand: Registration of the company 'Double A Ethanol Company

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	Limited' dated 23/03/2007.
/47/	Sub District Administrative Organization of Tathoom, Thailand: License of building construction dated 14/07/2008.
/48/	Department of Industrial Works, Thailand: Design Criteria for Ethanol plant in Manual for supervision of Ethanol plant in Thailand.
/49/	Ministry of Industry, Thailand: Industrial effluent standards; ministerial notification No.2 B.E.2539.
/50/	Richard Helmer and Ivanildo Hespanhol on behalf UNEP: Water Pollution Control - A Guide to the Use of Water Quality Management Principles; Year 1997
/51/	Agreement between Climate Change Capital and Double A Ethanol Company Limited for developing the project (wastewater treatment plant with biogas recovery) as CDM project dated 01/02/2008
/52/	Climate Change Capital Limited: Revised terms and conditions on existing proposal to Double A Ethanol Company Limited dated 29/07/2011.
/53/	UNFCCC: Web-link for global stakeholder consultation period; <a href="https://cdm.unfccc.int/Projects/Validation/DB/5GDOZEFXKGLA3FGW3FGGEZH7DX7XHM/view.html">https://cdm.unfccc.int/Projects/Validation/DB/5GDOZEFXKGLA3FGW3FGGEZH7DX7XHM/view.html</a> for the CDM project activity 'Double A Ethanol wastewater treatment plant'.
/54/	Bank of Thailand: Minimum Lending Rate (MLR) of commercial banks as of 19/11/2007
/55/	The Stock Exchange of Thailand: Price and Statistics – Market Statistics, website 'http://www.set.or.th/en/market/market_statistics.html#annual' in English language retrieved on 06/12/2012.
/56/	D. A. Research Centre Company Limited: Proposal for laboratory analysis for the biogas plant dated 07/11/2007
/57/	Contract (No. <b>AGT008/2550</b> ) for local supply of process equipment between Siemens Limited Thailand and Double A Ethanol Company Limited dated 24/12/2007
/58/	C.K.M. Corporation Co. Ltd.: Quotation for supply of PAM and caustic soda to Double A Ethanol Company Limited dated 07/11/2007
/59/	PEA: Electricity tariff applicable for different enterprises in Thailand, year 2007.
/60/	Provincial Waterworks Authority: Water tariff applicable for industrial facility, year 2007
/61/	Double A Ethanol Company Limited: Estimation on Maintenance of the biogas plant dated 13/03/2012.
/62/	UNFCCC: Registered CDM project (Ref. No. 6241); website 'http://cdm.unfccc.int/Projects/DB/TUEV-SUED1337330382.67/view' in English language retrieved on 06/12/2012.
/63/	Energy Policy & Planning Office, Ministry of Energy, Thailand: Average price of FO; website 'http://www.eppo.go.th/info/price/P05.xls' in English language retrieved on 06/12/2012
/64/	Energy Policy & Planning Office, Ministry of Energy, Thailand: Price Structure of Petroleum Products; website 'http://www.eppo.go.th/petro/price/index.html' in English language retrieved on 06/12/2012.
/65/	The Revenue Department, Thailand: Website 'http://www.rd.go.th/publish/6044.0.html' in English language retrieved on 06/12/2012.
/66/	Thailand Greenhouse Gas Management Organization: Summary Report 'The Study of emission factor for an electricity system in Thailand' year 2010.
/67/	Ministry of Natural Resource and Environment of Thailand: Environmental Impact Assessment requirements for projects by type and scale of activities, dated 16 /06/2009
/68/	Copy of mail communications between Double A Ethanol Company Limited and Climate Change Capital Limited for negotiations on terms and conditions for CDM project development from July 2009 to November 2009
/69/	Bank of Thailand: website 'http://www.bot.or.th/english/Pages/BOTDefault.aspx' in English language retrieved on 06/12/2012 to check the inflation rate in Thailand.
/70/	Website "http://www.docstoc.com/docs/68638764/GHG-Calculation-RoiEt-General-

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	Information-about-Project-3-Volume-of-wastewater' in English language retrieved on 12/12/2012 for checking the calorific value of biogas.
/71/	Energy Research and Development Institute-Nakornping. Chiang Mai University: Biogas to Fuel oil replacement ratio
/72/	Double A Ethanol Company Limited: Power of Attorney authorizing Mr. Teerachate Kenthaworn and Mr. Prisna Chanla to execute and sign any contract for CDM projects dated 20/01/2012
/73/	Thai National ID card for Mr. Prisna Chanla and Mr. Teerachate Kenthaworn
/74/	Paques BV: Statement of lifetime of IC internals (Digesters) dated 11/12/2012
/75/	Samir Kumar Khanal: " <u>Anaerobic Biotechnology for Bioenergy Production, principles and applications</u> "; Blackwell publishing, Year 2008
/76/	Climate Change Capital: Revised agreement between Climate Change Capital Limited and Double A Ethanol Company Limited replacing existing agreement (dated 01/02/2008) executed on 23/01/2012

### 2.2 Follow-up actions

On 19/09/2012 and 20/09/2012, RINA (Mr. Praveen K. Kumar, Technical Expert and CDM Validator) visited the project site in Srimaphote District under Prachinburi Province in Thailand for validation site visit of the project activity. The objective of the site visit was physical inspection of the project location and to resolve questions and issues identified during the document review and to perform interviews with relevant stakeholders in the host country.

The key personnel interviewed and the main topics of the interviews are summarized in the table below.

	Date	Name and Role	Organization	Topic
/a/	19/09/2012 and 20/09/2012	Mr. Deepjyoti Borah (Asst. Manager)	Representing Climate Change Capital Ltd.	Prior CDM consideration, Project Description, CDM consideration, Baseline identification, Project Boundary, project financing, Additionality, Emission Reduction calculation, etc.
/b/	19/09/2012 and 20/09/2012	Ms. Tanvi Bongale (Executive)	Representing Climate Change Capital Ltd.	
/c/	19/09/2012 and 20/09/2012	Mr. Prisna Chanla (Biogas Manager)	Double A Ethanol Company Limited	Regulatory requirements, project status, Monitoring procedures & Calibration of meters, Operation and Maintenance, Data recording, Emergency procedures, etc.
/d/	19/09/2012 and 20/09/2012	Mr. S. Mani Kannan (Process Specialist)	Double A Ethanol Company Limited	Process requirements, fuel details & Calibration of meters, Operation and Maintenance, Data recording, Emergency procedures, etc.
/e/	19/09/2012 and 20/09/2012	Mr. Nattopong Phowttomchai (Environmental Manager)	Double A Ethanol Company Limited	Environmental concerns, regulatory requirements etc.
/f/	19/09/2012	Mrs. Sompis Yoidee (Villager)	Local Stakeholder	Mode of Invitation for stakeholders meeting, Stakeholders meeting consultation, advantages
/g/	19/09/2012	Mr. Sumroeng	Local Stakeholder	

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		(Villager)		and disadvantages of the project, employment generation, etc.
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### 2.3 Resolution of outstanding issues

The objective of this phase of the validation is to resolve any outstanding issues which need to be clarified for RINA's positive conclusion on the project design.

To guarantee transparency a validation protocol has been customized for the project. The protocol shows in a transparent manner the requirements, means of validation and the results from validating the identified criteria. The validation protocol consists of four tables; the different columns in these tables are described in the figure below (see Figure 1). The completed validation protocol is enclosed in Appendix A to this report.

A corrective action request (CAR) is raised if one of the following occurs:

- The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions.
- The CDM requirements have not been met.
- There is a risk that the emission reductions cannot be monitored or calculate.

A clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is raised during validation to highlight issues related to project implementation that require review during the first verification of the project activity. FARs shall not relate to the CDM requirements for registration. CARs, CLs and FARs identified are included in the validation protocol in Appendix A of this report.

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Figure 1 Validation protocol tables

Validation Protocol, Table 1 - Mandatory requirement		
Requirement	Reference	Conclusion
The requirements the project must meet.	Makes reference to the documents where the answer to the requirement is found.	This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) if a requirement is not met. A request for clarification (CL) is used when the validation team has identified a need for further clarification.

Validation Protocol, Table 2 - Requirement checklist				
Checklist Question	Ref.	MoV	Comments	Conclusion
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organized in five different sections.	Makes reference to documents where the answer to the checklist question or item is found.	Explain how conformance with the checklist question is investigated. Examples are document review (DR), interview or any other follow-up actions (I), cross checking (CC) with available information relating to projects, (N/A) means not applicable.	The discussion on how the conclusion is arrived at and the conclusion on the compliance with checklist question so far.	For CAR, CL and FAR see the definitions above. OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements.

Validation Protocol, Table 3 - Resolution of Corrective Action Requests and Clarification			
Corrective action requests and/or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
The CAR and/or CLs raised in table 2 are repeated here.	Reference to the checklist question number in Table 2 where the CAR or CL is explained.	The responses given by the project participants to address the CARs and/or CLs.	The validation team's assessment and final conclusion of the CARs and/or CLs.

Validation Protocol, Table 4 - Forward Action Requests (if no FAR the table 4 is deleted)		
Forward action request	Reference to Table 2	Response by project participants Validation Conclusion
The FAR raised in table 2 is repeated here.	Reference to the checklist question number in Table 2 where the FAR is explained.	Response by the project participants on how forward action request will be addressed prior to first verification.

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## 2.4 Internal quality control

All the revisions of the validation report before being submitted to the client were subjected to an independent internal technical review to confirm that all validation activities had been completed according to the pertinent RINA instructions.

The technical review was performed by a technical reviewer(s) qualified in accordance with RINA's qualification scheme for CDM validation and verification.

## 2.5 Validation team and the technical reviewer(s)

The validation team and the technical reviewers consist of the following personnel:

Role/Qualification	Last Name	First Name	Country
Team Leader CDM	Menon	Rekha	India
CDM Validator	Buragohain	Champak	India
CDM Validator and Technical Expert	Kumar	Praveen K	India
Financial Expert	Varma	Karthika	India
Technical Reviewer	Raghavan Nair	Reghu Kumar	India
Technical Reviewer	Valoroso	Rita	Italy
Technical Reviewer in training	Alfieri	Felice	Italy

## 3 VALIDATION FINDINGS

The findings of the validation related to the project, as described in the PDD, version 03.1 of 27/12/2012, version 03 of 10/12/2012, and previous versions 02 of 07/11/2012 and 01 of 01/08/2012 **/01/**, are stated in the following sections.

The validation requirements, the means of validation, and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

### 3.1 Approval and Participation

The project's host Party is Thailand and the Annex I Party is United Kingdom.

Thailand and United Kingdom fulfil the requirements to participate in the CDM. Both have ratified the Kyoto protocol and established a DNA as the participating requirements for CDM under the Kyoto Protocol. Thailand ratified the Kyoto Protocol on 28/08/2002 **/12/** and established as DNA 'Thailand Greenhouse Gas Management Organization (TGO)' as per the UNFCCC website **/13/**; United Kingdom ratified the Kyoto Protocol on 31/05/2002 **/12/** and established as DNA 'Environment Agency' as per the UNFCCC website **/13/**.

The project participant(s) are Double A Ethanol Company Limited from Thailand and Climate Change Capital Limited from United Kingdom (Annex I country). Both project participants are private entities and they are correctly listed in table A.4 of the PDD and the information is consistent with the contact details provided in Appendix-1 of the PDD **/01/**.

The DNA of Kingdom of Thailand issued a Letter of Approval on 18/10/2012, authorizing Double A Ethanol Company Limited as project participant and confirming that the project assists in achieving sustainable development **/41/**. The Letter of Approval from United Kingdom was issued on 26/11/2012, authorizing Climate Change Capital Limited as project participant **/42/**. Both the letters were received directly by the PP and refer to the precise project activity in the PDD **/01/**

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Both letters of approval have been issued by respective DNAs of Kingdom of Thailand and United Kingdom for the specific project activity, and RINA has found no reason to doubt the authenticity of the LoAs by checking the original copy of the LoAs.

By checking the above documents **/41/**, **/42/** RINA considers the LoA in accordance with paragraphs 39-42 of the CDM-VVS **/06/**.

The project cost involves both debt and equity part. This has been confirmed from the loan agreement copy dated 08/12/2011 **/43/**. Thus it is also confirmed that the proposed project does not involve any public funding from any Annex I Party, and the validation did not reveal any information that indicated that the project could be seen as a diversion of official development assistance (ODA) funding towards the host country.

<b>Project participants</b>	Double A Ethanol Company Limited	Climate Change Capital Limited
<b>Parties involved</b>	Kingdom of Thailand (Host Country)	United Kingdom (Annex I Country)
<b>APPROVAL</b>		
<b>LoA received</b>	Yes <b>/42/</b>	Yes <b>/43/</b>
<b>Date of LoA</b>	18/10/2012	26/11/2012
<b>LoA received from</b>	Directly from PP	Directly from PP
<b>Validation of authenticity</b>	Verifying the original document <b>/42/</b>	Verifying the original document <b>/43/</b>
<b>Validity of LoA</b>	Yes	Yes
<b>PARTICIPATION</b>		
<b>Party is party to Kyoto Protocol</b>	Yes	Yes
<b>Voluntary participation</b>	Yes	Yes
<b>Project contribution to SD</b>	Yes	N/A

### 3.2 Modalities of communication

The MoC dated 06/12/2012 **/44/** was provided by Climate Change Capital Limited with whom RINA has a contractual relationship confirmed by the request of services signed on 16/07/2012 **/28/**. The corporate identity of the PPs and focal points included in the MoC statement has been checked through the company authorized letter and employment status with the company **/45/**, as well the personal identity through the copy of national ID cards **/73/** and the signature also from the national ID card copy and company declarations **/45/**, **/72/**.

RINA confirms that the MoC statement provided by the PP **/44/** is based on the currently valid form "Modalities of Communication Statement" (F-CDM-MOC) **/29/**, the information required by the form including its Annex 1 is correctly completed, and the PP authorized signatories signing the MoC correspond to the PP authorized signatories included in Annex 1.

In conclusion, RINA confirms that the MoC statement provided by the PP is in accordance with the requirements in para 53-55 as well it is in accordance with the requirements in para 60 of the CDM-VVS **/06/**.

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### 3.3 Project design document

The PDD for the project activity “Double A Ethanol wastewater treatment plant”, in “Thailand”, version 03.1. of 27/12/2012, version 03 of 10/12/2012, version 02 of 07/11/2012 and 01 of 01/08/2012/01/ submitted by Climate Change Capital Ltd. has been the basis for the validation process.

RINA thus confirms that the latest PDD, version 03.1 **/01/** is based on the currently valid PDD template **/14/** and is completed in accordance with the applicable guidance document “Guidelines for completing the project design document form” (version 01.0), dated 02/03/2012 **/08/**.

The main changes between the PDD version 1.0 of 01/08/2012 published for GSC and the PDD version 03.1 of 27/12/2012 submitted for registration are the following:

Section of the PDD	Description and reason for changing the information in that section
A.1	Implementation status of the project activity has been added..
A.2.4	The exact geographical co-ordinates of the project activity has been corrected in the final PDD as per the query raised by the validation teams after validation site visit.
Throughout the PDD	The CER value changed from 171,085 tCO <sub>2</sub> /year to 170, 983 tCO <sub>2</sub> /year in the final PDD <b>/01/</b> .
B.3	Project boundary has been corrected in line with the methodology.
B.4	Baseline identification has been updated in the final PDD with more transparent information on baseline scenario.
B.5	Chronology of events has been updated with credible evidences.
B.7.1	Monitoring parameters have been updated in line with the methodology and applicable tools.
C.2.2	Date of crediting period has been changed to the commissioning of the project plant or the date of request for registration of the project activity,

### 3.4 Project Design

#### Purpose and general description of the project activity:

The purpose of the project activity is to install a wastewater treatment plant of 5,000 m<sup>3</sup>/day capacity with an anaerobic digester to recover biogas and utilize for heat generation **/16/-/23/**. The project activity is implemented in a ethanol plant with an ethanol production capacity of 500,000 liters/ day which will generate wastewater of 5,000m<sup>3</sup>/day **/24/**. The generated biogas shall be used for heat generation, which will displace use of fuel oil (Bunker C fuel) in the boiler of a adjacent limekiln for heat generation. Therefore, the project activity will reduce greenhouse gas emissions through capture of methane which otherwise would have emitted from the wastewater of the ethanol production plant in open lagoons and replacement of fuel oil. However, the project activity shall not claim any emission reductions from the saving of fuel oil.

#### Project location:

The proposed location of the project activity is located within 304 Industrial Estate in Prachinburi province, Thailand. The latitude of the project activity is 13054'53.3"N (13.914808) and longitude is 101034'20.4"E (101.572332). The geographical coordinates of the project activity was checked with a GPS device during the site visit. The project location is also found consistent with the contract document between Double A Ethanol Company Limited and technology supplier (Siemens Limited Thailand) **/16/**.

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### Scenario existing prior to the implementation of the project activity:

The project activity is a green-field project implemented in a new ethanol production plant. Prior to the implementation of the project activity, there was neither any ethanol plant nor any wastewater treatment plant at the project activity site as confirmed during the site visit. This is further confirmed from the company registration certificate from Department of Revenue, Thailand dated 23/03/2007 **/46/** and building construction license **/47/**. It is also confirmed during the site visit that the construction of the ethanol plant along with the wastewater treatment plant is on-going with civil works. As per the PDD, the first phase includes the construction of the ethanol plant and the second phase includes the construction of the wastewater treatment plant with biogas recovery.

The proposed project is a Greenfield project. It is expected that without the implementation of the proposed project activity, wastewater from the ethanol production plant (500,000 liters/ day) would have been treated anaerobically through traditional open lagoon system without methane recovery. The same is also discussed in section 3.7 of this report.

### Technology(ies) employed:

As described above the wastewater treatment plant is designed to treat 5,000 m<sup>3</sup>/day of wastewater produced from the ethanol production plant of 500,000 liters/ day. It is envisaged that the wastewater will have COD of 42,000 mg/l before treatment **/24/**, **/25/**. Wastewater from the ethanol plant is initially directed to an Internal Circulation Reactor (IC Reactor) anaerobic digester system. There are three IC reactor tanks. The tanks perform anaerobic fermentation where most of COD and organic suspended solid substance are converted into biogas. The removal rate of COD is 90% **/16/-/23/**. It is expected that the project will generate 26,182,309 m<sup>3</sup> of biogas in a year. The biogas from the top of the IC reactor's degassing tank will be piped via a pressure/vacuum relief valve. The biogas will be supplied to an adjacent limekiln where biogas would be co-fired in the boiler, displacing the use of Fuel oil (Bunker C) fuel for heat generation. There will also be an open type flaring system for flaring unused biogas **/24/**. The emission reductions from the saving of fuel oil in heat generation are not claimed in the project activity. To confirm the project design and details, RINA has reviewed the project proposal **/24/**, drawings of the open lagoon wastewater treatment system **/25/** and the final contract documents with technology supplier **/16/-/23/**. The design details mentioned in the PDD is found to be appropriate. The sludge generated shall be send for land application without leading to release of any methane emissions. This shall be checked during first verification of the project activity (FAR1). The project technology is supplied by Siemens Limited, Thailand and hence no transfer of technology is involved.

### Project implementation:

The starting date of the project activity is 24/12/2007, when project proponent (Double A Ethanol Company Limited) executed the supply agreement with the technology supplier (Siemens Limited Thailand) **/16/**, **/17/**. It has been verified by RINA that the starting date represents the real action to start the project activity, as it is the earliest date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity as per the Glossary of CDM Terms **/11/**. During the site visit on 19/09/2012 and 20/09/2012 it was observed by the validation team that the ethanol plant along with the wastewater treatment plant is yet to be commissioned and construction work is in progress. The project is expected to be commissioned in the first quarter of 2013.

### Crediting period and estimated Emission Reductions:

The expected operational lifetime of the project activity is 15 years and this has been confirmed from the lifetime statement provided by the manufacture of the technology **/74/**. A fixed crediting period of 10 years has been chosen for the project, starting from the date of commissioning date(expected date 31/03/2013) of the project plant, or from the date of requesting registration of the project activity under UNFCCC, whichever is later. The GHG emission reductions are estimated to be average 170,983 tCO<sub>2</sub>e per year and 1,7 09,830 over the 10 years crediting period.

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## Contribution to sustainable development:

The project activity contributes towards the sustainable development of the host country. In line with the host country approval requirements, the project received HCA for the project activity on 18/10/2012 /41/.

RINA was able to verify all the documented evidence listed above during the validation process and can confirm that data and considerations are complete and accurate. Moreover RINA confirms that the description of the proposed CDM project activity, as contained in the PDD sufficiently covers all relevant elements, is accurate and complete and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity.

## 3.5 Application of selected baseline and monitoring methodology

The project correctly applies the approved baseline and monitoring methodology “ACM0014”, “Treatment of wastewater”, version 05.0.0 of 20/07/2012 /07/.

The proposed project activity meets the criteria defined in the baseline methodology as described below:

### Scenario 1:

**Description of the baseline situation:** *The wastewater is not treated, but directed to open lagoons that have clearly anaerobic conditions. In cases where solid materials are separated before directing the wastewater to the open lagoons, the solid materials have a different treatment than the wastewater.*

**Description of the project activity:** The wastewater is either treated in a new anaerobic digester or dewatered and directed to land application. In cases where solid materials are separated from the wastewater (both in the project and baseline scenarios), they will be treated separately and not treated with the new anaerobic digester employed for treatment of liquid effluents. The biogas extracted from the anaerobic digester and, if applicable, biogas generated from the treatment of solid materials, is flared and/or used to generate electricity and/or heat. The residual from the anaerobic digester, after treatment, is directed to open lagoons or is treated under clearly aerobic conditions (e.g. dewatering and land application).

RINA's assessment:

- The project is a green-field project activity; hence the wastewater will be treated in a new Internal Circulation(IC) Reactor as confirmed during the site visit and from the project design /24/. From the baseline study on open anaerobic lagoon without methane recovery /25/ and from the section 3.7 of this report, untreated wastewater (in the baseline scenario) from the ethanol factory is directed to open lagoons that have clearly anaerobic conditions. The separation of solid materials from the wastewater does not occur in the baseline. Based on the description of the project activity /01/, /24/ and information provided by the project participant during site visit, RINA considers that the application of Scenario 1 of Table 1 of the methodology /07/ is correct.
- Biogas is extracted from the new UASB bioreactor/IC reactor which has been confirmed during the site visit and proposal from technology supplier /24/. The bioreactor takes in wastewater from the ethanol factory which is rich in organic content. The anaerobic decomposition of organic matter results in methane rich biogas which shall be used for heat generation in a nearby limekiln. /24/.
- The residuals from the anaerobic digester (sludge), are subjected to land application.

### Scenario 2:

**Description of the baseline situation:** *The wastewater is treated in a wastewater treatment plant. Sludge is generated from primary and/or secondary settlers. The sludge is directed to sludge pit(s) that have clearly anaerobic conditions:*

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**Description of the project activity:** The wastewater is treated in the same wastewater treatment plant as in the baseline situation. The sludge from primary and/or secondary settler is treated in one or both of the following ways:

- (a) The sludge is treated in a new anaerobic digester. The biogas extracted from the anaerobic digester is flared and/or used to generate electricity and/or heat. The residual from the anaerobic digester after treatment is directed to open lagoons or is treated under clearly aerobic conditions (e.g. dewatering and land application);
- (b) The sludge is treated under clearly aerobic conditions (e.g. dewatering and land application).

RINA's assessment:

Applicability conditions for Scenario 2 are not applicable as the project activity does not include the treatment of sludge **/24/**. In addition, it has been concluded that Scenario 1 of ACM0014 version 05.0.0 **/07/** is applicable to the project activity as evidenced by the project design and confirmed during the site visit. This has been clearly specified in the PDD **/01/**.

*The average depth of the open lagoons or sludge pits in the baseline scenario is at least 1 m:*

- The average depth of the open lagoons in the baseline scenario has been determined by the baseline study on open anaerobic lagoon without methane recovery **/25/** to be 6 m, which is more than 1 m.

*The residence time of the organic matter in the open lagoon or sludge pit system should be at least 30 days:*

- The residual time of organic matter in open lagoon system is 30 days which is as per the baseline study report **/25/**.

*Inclusion of solid materials in the project activity is only applicable where: (i) Such solid materials are generated by the industrial facility producing the wastewater; and (ii) The solid materials would be generated both in the project and in the baseline scenario:*

- Not applicable for the project activity since the project activity does not include treatment of sludge or solid material. This is a Greenfield project, hence there was no sludge treatment in baseline. **/24/**.

*The sludge produced during the implementation of the project activity is not stored onsite before land application to avoid any possible methane emissions from anaerobic degradation:*

- The sludge shall be sent for land application without storing onsite which may lead to anaerobic degradation. This shall be cross checked during first verification of the project activity.

RINA hereby confirms that the selected baseline and monitoring methodology has been previously approved by the CDM Executive Board, and is applicable to the Project, which complies with all the applicability conditions therein and the selected version is valid at the time of submission of the proposed project activity for registration. It is also confirmed that the methodology is correctly applied by comparing it with the actual text of the applicable version of the methodology.

### 3.6 Project boundary

According to the approved baseline and monitoring methodology "ACM0014", "Treatment of wastewater", version 05.0.0 of 20/07/2012 **/07/** the spatial extent of the project boundary includes "the site where the wastewater is treated in both the baseline and the project scenario, the sites where the sludge/wastewater is applied to lands, any on-site power plants that supply electricity to the wastewater or sludge treatment system, any on-site facilities to generate heat that is used by the wastewater or sludge treatment systems, if applicable, the anaerobic digester, the power and/or heat generation equipment and/or the flare installed under the project activity, if applicable, any dewatering system installed under the project activity, if grid electricity is displaced from electricity generation with biogas from an aerobic digester: the power plants connected to the grid, with the geographical

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boundary as specified in the latest approved version of the 'Tool to calculate the emission factor for an electricity system'.

Applying this to the project activity, the project's system boundaries include the wastewater treatment system, the UASB anaerobic bioreactor/IC reactor, the open flare system and the sites where sludge shall be applied to land. Part of these component were verified during the site visit and from the agreement copies with the technology supplier */16/,/17/,/18/,/19/,/20/,/21/,/22/,/23/*.

Emissions sources included in the project boundary are shown in the table below:

	GHGs involved	Description
<b>Baseline emissions</b>	CH <sub>4</sub>	<i>Emission from the open lagoon wastewater treatment process:</i> Applicable as open lagoon would have been used in the baseline wastewater treatment system as confirmed from the baseline study report <i>/25/</i> .
<b>Project emissions</b>	CH <sub>4</sub>	<i>Emissions from the anaerobic digester:</i> The project involves an anaerobic digester for wastewater treatment and hence emissions accounted in line with the methodology <i>/07/</i> and the applied tool <i>/34/</i> .  <i>Emissions from flaring:</i> Applicable as the project activity involves the installation of an open flare system <i>/24/</i> . This is accounted as per the tool <i>/33/</i> .  <i>Emission from land application of sludge:</i> Applicable as the project activity involves land application of sludge <i>/24/</i> . This is accounted in line with the methodology <i>/07/</i> .
	N <sub>2</sub> O	<i>Emission from land application of sludge:</i> Applicable as the project activity involves land application of sludge <i>/24/</i> . This is accounted in line with the methodology <i>/07/</i> .
	CO <sub>2</sub>	<i>Emissions form on-site electricity use:</i> Applicable as the wastewater treatment plant shall be grid connected and hence, the project activity shall consume power from the grid.
<b>Leakage</b>	N/A	This project activity applies Scenario 1 of the methodology but does not include the treatment of solid materials in the digester in the project activity <i>/01/,/24/</i> . Therefore, leakage emissions are not calculated and this is in line with the requirements of ACM0014 version 05.0.0 <i>/07/</i> .

Emission sources which are not addressed by the applied methodology and which are expected to contribute more than 1% of the overall expected average annual emissions reduction have not been identified.

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By checking the information and the project site, RINA can confirm that the project boundary and emission sources described in the PDD are accurate and complete, and also that the selected sources and gases are justified for the proposed project activity.

### 3.7 Baseline scenario identification

The baseline determination follows a four-step process described in the methodology /07/, as below:

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

The project activity is applicable under scenario 1 of the methodology and hence, plausible alternative scenarios were determined for the treatment of wastewater (W in line with the methodology as outlined below:

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

The project activity involves heat generation with the recovered biogas in nearby limekiln and therefore, identified the plausible alternative scenarios in line with the methodology as per below:

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

The project activity does not involve electricity generation with the recovered biogas which has been confirmed from the proposal provided by the technology supplier /24/ and the final agreement copies with the technology supplier /16/-/23/ and hence no alternative for electricity component have been identified.

Further, the project activity does not involve treatment of solid material which has been confirmed from the proposal provided by the technology supplier /24/ and the final agreement copies with the technology supplier /16/-/23/. Hence, no alternative for treatment of solid materials (SM) are identified.

Since the project activity has been implemented in a Greenfield facility, the specification of scenario W1 has defined the following steps:

1. *Define several lagoon design options for the particular wastewater stream that meet the relevant regulations and take into consideration local conditions:*

The baseline study report identifies three design options based on depths anaerobic ponds (4m, 5m and 6m) considering all local conditions (temperature (30<sup>0</sup>C-40<sup>0</sup>C), pH of wastewater etc.) followed by facultative ponds for the wastewater treatment and discharge used for irrigation purposes, which is within the regulatory requirements of Thailand /25/. The design specifications/parameters considered for options includes average depth and surface area of the lagoon, electricity consumption, retention time of the organic matter and effluent flow in the anaerobic lagoon. The same is mentioned clearly in table B.4.1. of the latest PDD /01/. Hence , it complies with the applied methodology./07/

2. *Carry out an economic assessment of the identified options:*

The report selects the least cost option, in line with the methodology, to be the one with lagoon depth of 6m, as the same has minimum area requirement for treatment and hence, the least cost. The average depth could be further verified and substantiated with the published literature from Department of Industrial Works (DIW) giving the design criteria of anaerobic lagoons for ethanol industry (3-6m)

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**/48/** for industrial wastewaters. Thus, the least cost design option is considered in line with the literature survey, and hence, considered plausible, thus accepted.

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

The following baseline scenarios have been eliminated due to non-compliance with applicable laws and regulations:

W2: Direct release of wastewater to a nearby water body: The COD of the discharged wastewater is 42,000 mg/l, which is used as a basis in the project design **/01/**, **/24/**, **/25/**. This is above the discharge limit of 120 mg/l set by regulations **/49/**. Therefore, direct release of wastewater to a nearby water body does not comply with local regulations considering the high organic load on the effluent from the ethanol factory. By reviewing the design parameters of the ethanol plant **/24/**, **/25/** and the relevant regulations **/49/**, RINA considers the elimination of this alternative to be reasonable.

W6: Wastewater is directed to land application without dewatering: The COD of the discharged wastewater is 24,000 mg/l, which is used as a basis in the project design **/01/**, **/24/**, **/25/**. This is above the discharge limit of 120 mg/l set by regulations **/49/**. Therefore, it is considered that the practice does not comply with local regulations considering the high organic load on the effluent from the ethanol factory. By reviewing the design parameters of the ethanol plant **/24/**, **/25/** and the relevant regulations **/49/**, RINA considers the elimination of this alternative to be reasonable.

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

Under this step, the project proponent has eliminated alternatives that face prohibitive barriers.

The following baseline scenarios have been eliminated due to the **technological barrier**:

W3: Aerobic wastewater treatment facilities:

The project proponent has argued that this alternative is eliminated as it consumes large quantities of electricity in order to meet aeration demands of the wastewater treatment system (0.5-0.75 kWh for aeration of every 1 kg of COD removal) **/75/**. In addition, it involves an increased amount of sludge production as compared to anaerobic treatment **/75/**. Due to these factors, the project proponent argues that the complete treatment of wastewater in aerobic wastewater treatment plants is not a plausible alternative scenario.

W7: Wastewater is dewatered and directed to land application/used as a fuel in energy applications:

The project proponent has argued that this option is not plausible due to high volume of wastewater generated by the ethanol plant with high loads of soluble organic matter which would require primary treatment before being applied to land. From RINA's independent review of publicly available sources **/50/** it is RINA's opinion that this option is not the best alternative for treating wastewater of the proposed project activity.

The following baseline scenarios have been eliminated due to the **investment barrier**:

W4: Anaerobic digester with methane recovery and flaring:

This option requires additional investment. Moreover, does not generate any revenue. Further host country regulation does not mandate to apply this technology. Hence, it is uneconomical for PP to go for this option when the recovered biogas can be used to generate additional revenue via power generation or other applications. Hence, this option is considered not considered as plausible alternative.

H1: Co-generation of heat using fossil fuels in a captive cogeneration power plant:

As stated in the PDD there is no existing cogeneration plant in the project site. This was checked during the site visit by the validation team. Further, in RINA's opinion this alternative will not suffice the

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objective of the project activity that is treatment of wastewater. Hence, only for the heat generation component setting up a cogeneration plant is not a credible alternative.

H3: Heat generation using renewable sources:

The boiler where the biogas shall be used for heat generation was already running on fossil fuel (fuel oil). Retrofitting the boiler for renewable energy sources will only incur additional cost when the biogas is available from the project activity. Again setting up another renewable energy based heat generation (except biogas) will only lead to additional investment. Hence, in RINA's opinion this alternative is not a plausible alternative.

Hence, remaining alternatives are:

In case of wastewater treatment system:

W1: The use of open lagoon for the treatment of the wastewater, and

W5: Anaerobic digester with methane recovery and utilization for electricity or heat generation.

For heat generation:

H2: Heat generation using fossil fuels in a boiler

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

Since there is more than one remaining alternative, Step 4 is applicable. A comparison of the economic attractiveness without revenues from CERs for all alternatives that are remaining has been made. This is done by applying the investment comparison analysis with Net Present Value (NPV) used as indicator. This is considered suitable as some of the alternatives do not generate revenue. NPV is a commonly used financial indicator for this type of investment projects. It is RINA's opinion that, according to the guidance of the "*Tool for the demonstration and assessment of additionality*" **/32/**, the approach used by the project proponent is correct and acceptable to perform economic attractiveness comparison between the identified alternatives scenarios.

This is a green-field project and in this case, all these alternatives are associated with costs. Therefore, the choice of investment comparison analysis by the project proponent is deemed in accordance with the requirement of ACM0014 (version 05.0.0) **/07/**.

Out of the two alternatives (W1 & W5) for wastewater treatment the least cost option is W1 which has been further discussed in section 3.8 (additionality) of this validation report.

Hence, the baseline for the project activity is the alternative W1 (The use of open lagoon for the treatment of the wastewater) is in line the methodology.

All the assumptions and data used by the project participants are listed in the latest PDD, version 03.1 of 27/12/2012 **/01/**, including their references and sources; the approved baseline methodology "ACM0014", version 05.0.0 of 20/07/2012 **/07/** has been correctly applied to identify the most reasonable baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the proposed CDM project activity.

### 3.8 Additionality

According to the approved baseline and monitoring methodology "ACM0014", "Treatment of wastewater", 05.0.0 of 20/07/2012 **/07/**, the additionality of the project has been established applying the tool "Tool for the demonstration and assessment of additionality", version 06.1.0 **/09/**.

The additionality of the proposed project activity is further explicitly explained in the following steps:

### 3.9 Prior consideration of the clean development mechanism

#### Project starting date:

The starting date of the project activity is 24/12/2007, when the PP (Double A Ethanol Company Limited) had executed the supply and installation agreement with Siemens Limited Thailand for the wastewater treatment plant of 5000 m<sup>3</sup>/day capacity **/16/**, **/17/** as it is the earliest date when the PP (Double A Ethanol Company Limited) committed itself to expenditures related to the implementation of

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the project activity. RINA thus confirms that the starting date of the project activity is in line with the Glossary of CDM terms /11/, and is the first real action taken by PP to implement the project activity.

### Prior consideration of CDM:

It has been demonstrated that CDM was seriously considered before the decision to go ahead with the proposed project by the following activities in accordance with the "Clean Development Mechanism Project Standard" /05/.

The timeline of implementation of the project illustrated below has been reviewed and considered to be valid and realistic:

Date	Activity	Evidence
06/02/2007	Double A Ethanol Company Limited, Board of Directors Meeting to evaluate different options for the treatment of wastewater and possibility of availing carbon credit.	Extracts from the minutes of the Board Meeting No. 2/2007 /15/.
26/09/2007	Report prepared by 'Namsai 304 Company Limited' for treatment of 5000 m <sup>3</sup> /day of wastewater in anaerobic lagoon.	Copy of the report by Namsai 304 Company Limited /25/
05/10/2007	Proposal from 'Siemens Limited, Thailand' for wastewater treatment with biogas recovery in UASB digester/IC reactor.	Copy of the proposal /24/
19/11/2007	Double A Ethanol Company Limited, Board of Directors Meeting to finalize the wastewater treatment plant with biogas recovery considering the benefits of carbon credit.	Extracts from the minutes of the Board Meeting No.10/2007 /15/
24/12/2007	Execution of the supply and installation agreement with 'Siemens Limited Thailand' for the wastewater treatment plant of 5000 m <sup>3</sup> /day capacity which is the <b>start date of the project activity</b> .	Copy of contract agreement /16/, /17/.
01/02/2008	Agreement between Climate Change Capital and Double A Ethanol Company Limited for developing the project (wastewater treatment plant with biogas recovery) as CDM project.	Copy of the mandate letter /51/
23/05/2008	Double A Ethanol Company Limited conducted the local stakeholder meeting as part of CDM project cycle.	Advertisement for local stakeholders meeting, minutes of the stakeholder meeting, photographs of the stakeholder meeting etc. /27/
July 2009 to November 2009	Further negotiations on terms and conditions for CDM project development and purchase of CERs between Double A Ethanol Company Limited and Climate Change Capital Limited (also buyer of this project).	Copy of mail communications /68/
27/08/2010	Amendment on existing contracts with Siemens Limited, Thailand (Revision 01)	Copy of revised agreement /18/, /19/, /20/.
23/06/2011	Framework agreement signed between Climate Change Capital Limited (Annex-I party involved in the project activity) and RINA Service Spa.	Copy of the framework agreement /28/.
29/07/2011	Revised term sheet (CDM related) proposed by Climate Change Capital Limited to Double A Ethanol Company Limited.	Copy of the revised terms sheet letter /52/.
23/01/2012	Revised agreement between Climate Change	Copy of the revised agreement

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	Capital Limited and Double A Ethanol Company Limited replacing existing agreement dated 01/02/2008.	<b>/76/</b> .
10/08/2012	PDD webhosted for Global Stakeholder Consultation Period (Validation start of the project activity)	UNFCCC web-link <b>/53/</b> .

Thus the project starting date is 24/12/2007 when PP (Double A Ethanol Company Limited) signed contract with the technology supplier (Siemens Limited, Thailand) for installing the wastewater treatment plant **/16/**, **/17/**. It has been verified by RINA that the starting date represents the earliest date on which the project participant has been committed legally to expenditures related to the implementation of the project activity, which is in line with the Glossary of CDM Terms **/11/**.

Since the project start date is before 02/08/2008 and the identified start date is prior to 10/08/2012 when the PDD was published for global stakeholder consultation, the PP needs to demonstrate that the CDM was seriously considered in the decision to implement the project activity, that the benefits of CDM were a decisive factor in the decision to proceed with the project and that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation.

RINA was able to check the documents listed in the above chronology table and found that there is less than 2 years of gap between the documented evidence and hence considers that CDM was seriously considered in the decision to proceed with the project activity and satisfactory actions were undertaken to secure CDM status in parallel with the physical implementation of the project activity according to "Clean Development Mechanism Project Standard" **/05/**.

In conclusion, RINA can confirm that the CDM was considered seriously in the decision to implement the project activity according to paragraph 107 of the CDM-VVS, version 02.0 **/06/**.

### 3.10 Identification of alternatives

As discussed in section 3.7 of this report the identified alternative scenarios for the project activity are consistent with all applicable and enforced legislation.

The identified baseline scenario is the alternative W1 (The use of open lagoon for the treatment of the wastewater) which is in line the methodology. Further, for heat generation component, the baseline is the alternative H2 (Heat generation using fossil fuels in a boiler) which is also in line with the methodology. However, emission reductions from heat generation component are not included in the project activity.

RINA can confirm that the alternatives identified in the PDD are credible and complete.

### 3.11 Investment analysis

#### Choice of approach:

The investment comparison analysis (Option II of the Tool for the demonstration and assessment of additionality **/09/**) has been selected to demonstrate the additionality of the project. This is deemed reasonable since this is a green-field project and all alternatives require investment. The investment comparison analysis is applied with NPV as the financial indicator. This is considered suitable as some of the alternatives do not generate revenue. NPV is a commonly used financial indicator for this type of investment projects. The choice of approach is deemed reasonable and in accordance with the 'tool for the demonstration and assessment of additionality' **/09/**.

#### Input Parameters:

The validation team of RINA validated the input values and assumptions in the investment analysis by checking the original and other supportive documents as detailed below. It is noted that the values of

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the input values stated in the PDD are consistent with that of the financial calculation sheet /03/. The lifetime of the project technology is confirmed to be 15 years as per the lifetime statement provided by the manufacture of the technology /74/ and the investment analysis is done for the period of 15 years and hence is justified as per the guidelines on assessment of investment analysis /30/.

Confirmation of the values in the PDD and investment analysis fully consistent with the source of data's/15/,/16/,/17/,/18/,/19/,/20/,/21/,/22/,/23/,/24/,/25/,/54/,/55/,/56/,/57/,/58/,/59/,/60/,/61/,/62/,/63/,/64/,/69/,/70/,/71/,and /74/ RINA compared the input parameters for the financial analysis included in the PDD and in the financial spreadsheet with the parameters stated in the available public sources and third party reports and was able to confirm that the values applied are consistent with the values stated in the document mentioned before.

Assessment of the period between investment decision /15/ and start date of the project activity/16/,/17/. The board meeting was conducted for CDM consideration and investment in the proposed project activity on 19/11/2007/15/ and EPC contract/16/,/17/ had been signed on 24/12/2007, which is the start date of the project activity .Therefore , it is noted that there is no much time gap between the investment decision and start date of the project activity .

The input parameters used in the financial analysis were cross-checked and all data sources used to cross-check were checked during the validation process. The following is carried out:

### Input values for Baseline NPV analysis:

Parameter	Value	Source	Validation Assessment and cross checking
Wastewater flow (m <sup>3</sup> /day)	5,000	As per the proposal from Namsai 304 Company Limited /25/.	The value has been taken as per the proposal submitted by Namsai 304 Company Limited dated 26/09/2007 /25/ and was available at the time of investment decision /15/.
Total Investment Cost (THB):	118,442,500	As per the proposal from Namsai 304 Company Limited /25/.	The total cost includes the land cost (91,500,000 THB), three anaerobic pond cost (16,200,000 THB), Facultative pond cost (2,100,000 THB), Aerobic pond cost (2,100,000 THB) and other equipment and other costs includes material cost, labor cost (6,460,000 THB). The value has been taken as per the proposal submitted by Namsai 304 Company Limited dated 26/09/2007 /25/ and was available at the time of investment decision /15/.
Annual operating and maintenance cost (THB)	13,200,000	As per the proposal from Namsai 304 Company Limited /25/.	The value has been taken as per the proposal submitted by Namsai 304 Company Limited dated 26/09/2007 /25/ and was available at the time of investment decision /15/.
Debt equity ratio	1.10	The Stock Exchange of Thailand /55/.	The average annual D/E data of 2005, 2006 and 2007 of "Agribusiness" of group: "Agro & Food Industry" has been considered from figures published by the Stock Exchange of Thailand /55/. The value was applicable at the time of investment decision and hence accepted any the validation team.
Interest Rate (%)	7.26%	Published data from Bank of Thailand /54/.	Average minimum lending rate (MLR) provided by the commercial banks of Thailand as of 19/11/2007 has been considered by PP (Double A Ethanol Company Limited) /54/. The MLR represents the minimum rate applicable for debt financing available to

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			project developers. Since the rate as applicable at the time of investment decision and hence deemed to be acceptable.
Life of the project	15 years	As per the proposal from Namsai 304 Company Limited /25/.	As per the proposal from Namsai 304 Company Limited the project life is 15 years and hence NPV analysis had been carried out for 15 years.
Annual Operating days	330	As per the proposal from Namsai 304 Company Limited /25/.	The value has been taken as per the proposal submitted by Namsai 304 Company Limited dated 26/09/2007 /25/ and was available at the time of investment decision /15/.

The baseline NPV is calculated based on the input values provided in the report prepared by third party /25/, where the assumptions are based on the experience of the expert in the region. The validation team has checked the report and found that all major input parameters are as per the report. Some other input values are taken from publicly available sources /54/, /55/. The input values in the baseline study were applicable at the time of investment decision. Therefore, the assessment team considered the requirements of "Tool for the demonstration and assessment of additionality" /09/ and "Guidelines on the assessment of investment analysis" /30/ met. The resulted NPV for the baseline case is calculated as -220, 738,761.

### Input values for Project NPV analysis:

Parameter	Value	Source	Validation Assessment and cross checking
Wastewater flow (m <sup>3</sup> /day)	5,000	As per the proposal from technology supplier (Siemens Limited, Thailand) /24/.	The value has been taken as per the proposal submitted by technology supplier (Siemens Limited, Thailand) dated 15/10/2007 /24/ and was available at the time of investment decision /15/. The validation team has further checked the actual contract agreement with the technology supplier and found the wastewater flow capacity to be same /16/-/23/ and hence accepted.
Total Investment Cost (THB):	638,000,000	As per the proposal from technology supplier (Siemens Limited, Thailand) /24/.	The total cost includes the supply of process equipment cost (221,417,400 THB), Local supply of process equipment cost (102,024,600 THB), turnkey installation cost (50,558,000 THB), other associated cost (119,000,000 THB) and utilize gas to limekiln cost (145,000,000 THB). The value has been taken as per the proposal submitted by the technology supplier (Siemens Limited, Thailand) dated 15/10/2007 /24/ and was available at the time of investment decision /15/. The validation team has checked the actual contract agreement copies with the technology suppliers dated 24/12/2007 which includes the supply of process equipment cost (221,417,400 THB), Local supply of process equipment cost (102,024,600 THB) and turnkey installation cost (50,558,000 THB) with no variation from the proposal cost /16/,/17/, /57/. However, since the execution of the project got delayed and hence the contract with the technology supplier was revised again on 27/08/2010 and the revised cost

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			incurred as follows: for supply of process equipment cost (237,986,618 THB), Local supply of process equipment cost (109,166,322 THB) and turnkey installation cost (54,097,060 THB). Since the cost for all these major components further increased by 7% it is conservative to consider the lower cost available at the time of investment decision.
Annual savings in terms of FO consumption	98,919,736	Actual market FO price <b>/63/</b> .	The price of FO is the actual market price at the time of investment decision <b>/63/</b> . The FO saving is calculated as equivalent amount of heat generated by the biogas (calculated considering net calorific value of biogas <b>/70/</b> , annual biogas captured and the ratio of FO-biogas replacement <b>/71/</b> ). The calculation is presented in the NPV calculation worksheet <b>/03/</b> . The validation team has cross checked the FO price from the publicly available sources and found to be correct <b>/63/</b> , <b>/64/</b> . Hence, price considered is accepted by the validation team,
Annual operating cost (THB/year) (9% of total project cost)			
Annual Laboratory cost	495,000	As per quotation from laboratory <b>/56/</b> .	The laboratory cost which includes analysis of various components (pH, temperature, total solid, suspended solid, COD, BOD etc.) in the biogas plant in a year is as per proposal from D. A. Research Centre Company Limited dated 07/11/2007. The cost was available at the time of investment decision and hence accepted by the validation team. Further, the project activity is yet to be commissioned and hence actual cost is yet to be realized. However, it can be concluded that the cost can only go high compared to the year 2007. Hence, the value is deemed conservative.
Annual PAM cost	1,511,895	As per quotation from supplier <b>/58/</b> .	The cost of PAM (119 BHT/kg) is as per quotation from supplier <b>/58/</b> and was available at the time of investment decision. The annual PAM requirement (0.01 kg/m <sup>3</sup> of wastewater) is cross checked by the validation team as per the contract document with technology supplier <b>/16/</b> . Hence, accepted by the validation team.
Annual cost on caustic soda (NaOH)	22,019,250	As per quotation from supplier <b>/58/</b> .	The cost of caustic soda (8.50 BHT/kg) is as per quotation from supplier <b>/58/</b> and was available at the time of investment decision. The annual caustic soda requirement (1.57 kg/m <sup>3</sup> of wastewater) is cross checked by the validation team as per the contract document with technology supplier <b>/16/</b> . Hence, accepted by the validation team.
Annual electricity cost	28,902,981	As per rate of PEA <b>/59/</b> .	The grid electricity tariff considered is as per PEA tariff rate which was available at the time of investment decision <b>/59/</b> . Annual electricity requirement (28,795kWh/day) is cross checked by the validation team as per the

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			contract document with technology supplier /16/. Hence, accepted by the validation team.
Annual cost on water	6,937,920	As per tariff rate from PWA /60/.	The water tariff considered is as per PWA tariff rate which was available at the time of investment decision /60/. Annual waste water requirement (36.5m <sup>3</sup> /hour) is cross checked by the validation team as per contract document /16/. Hence, accepted by the validation team.
Annual Maintenance cost (THB/year) 2% of the project cost when calculated as yearly expenditure over the life time of the project.			
1 <sup>st</sup> year & 2 <sup>nd</sup> year	425,333	PP's estimation /61/	The annual maintenance cost was estimated by PP at the time of investment decision /61/. It is to be noted that the O & M cost provided in case of open lagoon system accounts to 11% of the project cost (baseline scenario). Further, the validation team cross checked the maintenance cost with another registered CDM project of same nature in Thailand /62/ and found that it accounts to 6% of the project cost. Hence, validation team is of the opinion that the maintenance cost considered is appropriate.
3 <sup>rd</sup> year to 5 <sup>th</sup> year	6,380,000		
6 <sup>th</sup> year onwards	12,760,000		
Debt equity ratio	1.10	The Stock Exchange of Thailand /55/.	The average annual D/E data of 2005, 2006 and 2007 of "Agribusiness" of group: "Agro & Food Industry" has been considered from figures published by the Stock Exchange of Thailand /55/. The value was applicable at the time of investment decision and hence accepted any the validation team.
Interest Rate (%)	7.26%	Published data from Bank of Thailand /54/.	Average minimum lending rate (MLR) provided by the commercial banks of Thailand as of 19/11/2007 has been considered by PP (Double A Ethanol Company Limited) /54/. The MLR represents the minimum rate applicable for debt financing available to project developers. Since the rate as applicable at the time of investment decision and hence deemed to be acceptable.
Life of the project	15 years	As per the certificate from equipment manufacturer /74/.	As per the certificate from the digester manufacturer the life of IC reactor is 15 years /74/. Hence, the project life of 15 years has been considered and accordingly NPV analysis had been carried out for 15 years.
Annual Operating days	330	As per the proposal from technology supplier /24/.	The value has been taken as per the proposal submitted by technology supplier (Siemens Limited, Thailand) dated 15/10/2007 /24/ and was available at the time of investment decision /15/.
Tax rate	30%	As per income tax rule, the revenue department /65/.	The tax rate is as per the income tax rate from the revenue department, Thailand /65/. Hence, accepted by the validation team.

The resulted NPV for the project case is calculated as -344,000,004

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### Calculation and conclusion:

The validation team assessed the correctness of computations and documents carried out by the project participant. The assessment includes checking the data input taken from quotations/documents, adoption or correct accounting practice and arithmetical accuracy. The accounting principles adopted with respect to computation are found to be in order. The arithmetical accuracy is also found to be correct.

The NPV calculation **/03/** was provided in excel spreadsheet and verified. The assumptions used in the calculations were deemed to be correct and verified by RINA. The project NPV without CDM revenue is -344,000,004 and the baseline project NPV is -220,738,761 which confirms that the proposed project activity cannot be considered as the most financially attractive without CDM benefits.

### Sensitivity Analysis:

The Guidelines on the assessment of investment analysis **/30/** requires that the investment analysis should contain a sensitivity analysis that supports the robustness of the conclusion arrived at by varying the critical assumptions to a reasonable variation ( $\pm 10\%$ ). The project developer has identified the following parameters as the most critical assumptions.

- Project cost
- Operational cost
- FO price (as revenue)

Results of sensitivity analysis are presented below:

#### Based on Project Cost:

Variation	-10%	0%	+10%
NPV	-284,515,653	-344,000,004	-403,484,354

#### Based Operational cost:

Variation	-10%	0%	+10%
NPV	-286,420,342	-344,000,004	-401,579,665

#### Based on FO price (as revenue):

Variation	-10%	0%	+10%
NPV	-403,484,354	-344,000,004	-261,335,991

The above analysis shows that the project NPV does not meet the baseline NPV even at  $\pm 10\%$  variations of the above parameters. The following table reveals the changes/variations required to the parameters for the NPV to reach the baseline NPV.

Parameter	Changes/Variations	Possibility of the situation
Project Cost	Project cost decreases by 18.38%.	The project cost has been taken as per the proposal submitted by the technology supplier (Siemens Limited, Thailand) dated 15/10/2007 <b>/24/</b> and was available at the time of investment decision <b>/15/</b> . The validation team has checked the actual contract agreement copies with the technology suppliers dated 24/12/2007 which includes the supply of process equipment cost (221,417,400 THB), Local supply of process equipment cost (102,024,600 THB) and turnkey installation cost (50,558,000 THB) with no variation from the proposal cost <b>/16/,/17/, /57/</b> . However,

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		since the execution of the project got delayed and hence the contract with the technology supplier was revised again on 27/08/2010 and the revised cost incurred as follows: for supply of process equipment cost (237,986,618 THB), Local supply of process equipment cost (109,166,322 THB) and turnkey installation cost (54,097,060 THB). Since the cost for all these major components further increased by 7%, there is no possibility to decrease the project cost by 18.38% from the cost taken at the time of investment decision.
Operational Cost	Decreased by 21.40%	The operational cost includes cost related to electricity consumption, PAM cost, caustic soda, laboratory cost and water cost. Since the cost of these raw materials can only be expected to increase considering host country inflation pattern /69/ and hence a further decrease of 21.40% over the cost at the time of investment decision is not a realistic scenario.
Project Revenue/FO price	FO price increases by 14.91%	At the time of investment decision the FO price considered 15.17 BHT/kg which is average of three years (2005, 2006 and 2007) FO price. Further, the validation team has cross checked from publicly available source and found that the average price of FO over last 5 years is 17.08 BHT/lit /64/. Considering the same the NPV of the project activity does not cross the baseline NPV. Hence, the scenario is deemed to be unrealistic.

As shown above, the PP has carried out a fairly exhaustive sensitivity analysis which proves that the project NPV does not meet the baseline NPV within the possible scenarios.

In conclusion, the result of the NPV analysis and sensitivity analysis have shown that the project is highly dependent on the CDM benefits and that without the income from CERs, the project activity is not financially attractive.

### 3.12 Barrier analysis

The additionality of the project has been demonstrated by applying the investment analysis, thus no barrier analysis is carried out.

### 3.13 Common practice analysis

The common practice analysis has been undertaken in line with the 'tool for the demonstration and assessment of additionality' /09/. An assessment of the common practice analysis is done as follows:

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

The proposed project activity is designed to treat wastewater of 5,000 m<sup>3</sup>/day from an ethanol plant of 500,000 l/day capacity. Hence, wastewater plant of 7,500 m<sup>3</sup>/day to 2,500 m<sup>3</sup>/day has been selected by the project proponent as applicable range. Thus, it is confirmed that the applicable output range is +/-50% of the design capacity of the wastewater treatment facility.

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

The project proponent has selected the entire host country of Thailand as the applicable geographical area by applying the default option specified in paragraph 5 of the tool /09/.

The project proponent has identified all ethanol plants in the host country with commercial operation before 24/12/2007 (start date of the project activity); however the wastewater generation is not within the range as identified in step 1 above. The validation team has cross checked the publicly available source for the same and found the information to be correct /40/. As a result,  $N_{all}$  is '0'. In conclusion, RINA considers that the determination of  $N_{all}$  is in accordance with Step 2 specified in paragraph 47 of the tool /32/.

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

Since,  $N_{all}$  identified in step 2 is zero, automatically;  $N_{diff}$  becomes zero in line with the paragraph 47 of the tool /32/.

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

Using the formula  $F = 1 - N_{diff}/N_{all}$ , the project proponent has calculated the factor F to be 1. Similarly,  $N_{diff} - N_{all}$  is calculated to be 0.

The project proponent has concluded that the proposed project activity is not a common practice in the applicable geographical area of Thailand due to the

b)  $N_{diff} - N_{all}$  is 0, which is lower than the limit of 3

Due to this, RINA concurs with the findings of the project proponent that the proposed project activity is not a common practice in the applicable geographical area of Thailand.

### 3.14 Conclusion

RINA can confirm that all data, rationales, assumptions, justifications and documentation provided by the project participants to support demonstration of additionality are credible and reliable.

By assessing the evidences presented and cross-checking the information contained in, RINA considers the reasoning for the proposed project additionality demonstration is credible and reasonable i.e. the proposed project has the ability to reduce anthropogenic emissions of greenhouse gases by sources below those that would have occurred in the absence of the registered CDM project activity.

### 3.15 Monitoring Plan

The approved consolidated baseline and monitoring methodology ACM0014 "treatment of wastewater" Version 05.0.0 /07/ has been correctly applied by PP. The monitoring plan is in accordance with the monitoring methodology; the monitoring plan will give opportunity for real measurement of achieved emission reductions.

RINA has checked all the parameters presented in the monitoring plan against the requirements of the methodology; no deviations relevant to the project activity have been found in the plan.

RINA confirms that the monitoring arrangements described in the monitoring plan are feasible within the project design, and the means of implementation of the monitoring plan are sufficient to ensure the emission reductions achieved by/resulting from the proposed CDM project activity can be reported ex post and verified.

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### Parameters determined ex-ante:

The ex-ante parameters that are mentioned in the methodology are included in the PDD and are provided in compliance with the methodology:

	Data/parameter	Unit	Value applied	Assessment
1	Inlet wastewater COD concentration ( $COD_{in,x}$ )	mg/l	42,000	The project is a Greenfield project and hence, design COD inflow as identified in the baseline design /25/ has been considered in line with the methodology.
2	Outlet wastewater COD concentration ( $COD_{out,x}$ )	mg/l	120	This parameter is determined to be 120 mg COD per litre of wastewater. It is based on local regulations /49/. This is conservative as the baseline study confirmed that the designed wastewater treatment system is able to provide a final discharge quality of 120 mg COD per litre of wastewater /25/.
3	Maximum methane producing capacity ( $B_o$ )	ton $CH_4$ /ton COD	0.21	The value applied is 0.21 ton $CH_4$ /ton COD. This is taken as a conservative assumption and checked with the methodology /07/.
4	Average depth of the lagoon (D)	m	6	The average depth of the lagoon is 6 m. This is verified from the baseline study report /25/.
5	Factor expressing the influence of the depth of the lagoon on methane generation ( $f_d$ )	percentage	70%	The value applied is 70% as the depth of the baseline open lagoon is determined to be 6m. This is verified from the baseline study /25/.
6	Grid emission factor in the year y ( $EF_{grid,y}$ )	t $CO_2$ /MWh	0.5113	The grid emission factor is the combine margin emission factor derived considering 50% simple operating margin and 50% build margin in line with the 'tool to calculate the emission factor for an electricity system' /10/ following publicly available latest data available at the time of starting validation of the project activity /66/.
7	Average technical transmission and distribution losses for providing electricity to source in year y ( $TDL_y$ ).	percentage	20%	Default 20% for project emission calculation in line with the 'Tool to calculate baseline, project and/or leakage emissions from electricity consumption' /38/.
8	Fraction of biogas that leaks from the digester ( $FL_{biogas,digest}$ )	m <sup>3</sup> biogas leaked / m <sup>3</sup> biogas produced	0.05	The project participant selects the default leak factor of 0.05 m <sup>3</sup> biogas leaked per m <sup>3</sup> of biogas produced. The methodology /07/ has been checked and this is found to be acceptable.
9	N <sub>2</sub> O emission factor for nitrogen from sludge applied	t N <sub>2</sub> O/t N	0.016	Default value in line with the methodology /07/.

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	to land ( $EF_{N_2O, LA, sludge}$ )			
10	Methane conversion factor for the application of sludge to lands ( $MCF_{sludge, LA}$ )	Default value	0.05	Default value in line with the methodology /07/.
11	Global warming potential for $CH_4$ ( $GWP_{CH_4}$ )	Default value	21	Default value in line with the methodology /07/.
12	Global warming potential for $N_2O$ ( $GWP_{N_2O}$ )	Default value	296	Default value in line with the methodology /07/.
13	Fraction of methane in the biogas ( $fCH_{4, default}$ )	$Nm^3 CH_4 / Nm^3 biogas$	0.6	Default value in line with the tool 'Project and leakage emissions from anaerobic digesters' /34/.
14	Density of methane at normal conditions ( $\rho_{CH_4}$ )	$tCH_4 / Nm^3 CH_4$	0.00067	Default value in line with the tool 'Project and leakage emissions from anaerobic digesters' /34/.
15	Universal ideal gases constant ( $R_u$ )	$Pa \cdot m^3 / kmol \cdot K$	8314	Default in line with the tool 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' /35/.
16	Molecular mass of greenhouse gas $i$ ( $CH_4$ )	$kg / kmol$	16.04	Default in line with the tool 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' /35/.
17	Total pressure at normal conditions ( $P_n$ )	$Pa$	101,325	Default in line with the tool 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' /35/.
18	Temperature at normal conditions ( $T_n$ )	$K$	273.15	Default in line with the tool 'Tool to determine the mass flow of a greenhouse gas in a gaseous stream' /35/.
19	Ideal gas constant ( $R$ )	$cal / K \cdot mol$	1.987	Default in line with the methodology /07/.
20	Activation energy constant ( $E$ )	$cal / mol$	15,175	Default in line with the methodology /07/.

### Parameters Monitored ex-post:

The ex-post parameters that are mentioned in the methodology are included in the PDD and are provided in compliance with the methodology, and they will be monitored during the crediting period:

	Parameter	Description/Assessment
1	Quantity of wastewater that is treated in the anaerobic digester; $F_{PJ, dig, m}$ ( $m^3 / month$ )	Monitored continuously using a flow meter having an accuracy level of $\pm 0.1\%$ . Recorded hourly for annually aggregate.
2.	Chemical oxygen demand in the wastewater that is treated in the anaerobic digester; $COD_{dig, m}$ ( $tCOD / m^3$ )	This is monitored on a weekly basis with average monthly and annual values calculated.
3.	Average chemical oxygen demand in the effluent from the digester in month $m$ ; $COD_{eff, dig, m}$ ( $tCOD / m^3$ )	This is monitored on a weekly basis with average monthly and annual values calculated.
4	Average chemical oxygen demand	This is monitored on a weekly basis with average

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	in the effluent discharged in month $m$ ; $\text{COD}_{\text{discharge},m}$ (tCOD/m <sup>3</sup> )	monthly and annual values calculated.
5	Total amount of biogas collected at the outlet of the digester tanks, Volumetric flow of the gaseous stream $I$ (biogas) in minute; $F_{\text{biogas},y} / V_{t,db} / F_{\text{CH}_4, RG, m} / Q_{\text{biogas},y}$ (m <sup>3</sup> /yr)	Monitored continuously using a gas flow meter having an accuracy level of $\pm 1\%$ . Recorded hourly and aggregated annually.
6	Volumetric flow of biogas to the boiler; $F_{\text{biogasKILN},y}$ (m <sup>3</sup> /yr)	Monitored continuously using a gas flow meter having an accuracy level of $\pm 1\%$ . Recorded hourly and aggregated annually.
7	Volumetric flow of Biogas to flare; $F_{\text{biogasFLARE},y}$ (Nm <sup>3</sup> /yr)	Monitored continuously using a gas flow meter having an accuracy level of $\pm 1\%$ . Recorded hourly and aggregated annually.
8	Concentration of methane in the total biogas supply, Volumetric fraction of greenhouse gas $i$ in the gaseous stream in a time interval $t$ on a dry basis; $W_{\text{CH}_4, \text{biogas}, y} / V_{i,t,db}$ (Kg CH <sub>4</sub> /m <sup>3</sup> , m <sup>3</sup> CH <sub>4</sub> /m <sup>3</sup> gas)	Monitored continuously using a gas analyzer having an accuracy level of $\pm 1\%$ . Recorded hourly and aggregated annually.
9	Flame detection of flare in the minute $m$ ; Flame <sub>m</sub> (Flame on or Flame off)	The sensor will be installed and linked to computer display to show status of the flame. Continuously, it will display on/off status on the computer display. This will be accompanied by a record of the time the flare is operational to determine when and for how long the flare was operational.
10	Amount of electricity in the year $y$ that is consumed at the project site for the project activity; $EC_{PJ,y}$ (MWh/yr)	Continuous monitoring using an electric meter with monthly recording and aggregated annually.
11	Quantity of sludge applied to land in year; $S_{LA,y}$ (m <sup>3</sup> /month)	Continuously monitored in weigh bridge and aggregated monthly.
12	Average temperature at the project site in month $m$ ; $T_{2,m}$ (K)	Monitored continuously and recorded monthly. The project proponent has clarified that average temperature at the project site obtained from weather statistics will be converted to Kelvin. This is deemed acceptable.
13	Temperature in the exhaust gas in the flare; $T_{\text{flare}}$ (°C)	Monitored continuously using a thermocouple. Recorded hourly when the flare is in operation.
14	Maintenance events completed in year $y$ ; Maintenance <sub>y</sub> (Calendar dates)	Record the date that maintenance events were completed in year $y$ . Records of maintenance logs must include all aspects of the maintenance including the details of the person(s) undertaking the work, parts replaced, or needing to be replaced, source of replacement parts, serial numbers and calibration certificates.

### Management system and quality assurance:

The project participant plans to implement an automated monitoring system. Data related to the CDM project will be recorded at the frequency specified in the monitoring plan and stored in electronic or paper form as appropriate. These records will be kept during the crediting period of 10 years and an additional 2 years after the end of crediting period. Calibration and maintenance of monitoring equipment will also be done as defined in national or international standards. Therefore, it is concluded that data management and QA/QC procedures are sufficient to ensure that the emission reductions from the project can be reported ex-post and verified.

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The operational and management structure implemented by PP is summarized below:

- The process operator and the laboratory manager collect all monitoring data on daily basis.
- The project proponent shall designate a CDM project manager who will review the data submitted by process operator and ensure quality control measures. This shall be supported by external consultancy firm and forward to the plant manager.
- The plant manager shall approve all monitoring data.

RINA confirms that the monitoring plan mentioned in the PDD is in accordance with the requirements mentioned in the monitoring methodology and the local regulatory requirements of the state utility, as well the monitoring arrangements described in the monitoring plan are feasible within the project design. RINA is of the opinion that the monitoring plan will give opportunity for real measurement of achieved emissions reductions for 2 years after the crediting period.

### 3.16 Estimation of GHG emissions

The emission reduction  $ER_y$  by the proposed project activity during the crediting period is the difference between baseline emissions ( $BE_y$ ), project emission ( $PE_y$ ) and emissions due to leakage ( $L_y$ ) as follows:

$$ER_y = BE_y - PE_y - L_y$$

#### Baseline emissions:

As per ACM0014 Version 05.0.0, the baseline emissions are calculated in three components, (i) baseline emissions from anaerobic treatment of the wastewater ( $BE_{CH_4}$ ), (ii) baseline emissions from generation and consumption of electricity ( $BE_{EL,y}$ ) and (iii) baseline emissions from heat generation ( $BE_{HG,y}$ ). The calculation is as follows:

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

#### Step 1: Calculation of baseline emissions from anaerobic treatment of the wastewater. Methane emissions from anaerobic treatment of the wastewater in open lagoons in the absence of the project activity ( $BE_{CH_4,y}$ ):

In line with the methodology, project proponent shall use minimum value between methane produced after implementation of the project activity ( $Q_{CH_4,y}$ ) and methane conversion factor method ( $BE_{CH_4,MCF,y}$ ) for the estimation of methane emissions from open lagoons. Since the project activity is implemented in a green-field facility, only the Methane Conversion Factor Method is applicable. This is documented in the PDD /01/, the emission reduction spread sheet /02/ and is accordance with the methodology /07/.

$$BE_{CH_4,y} = \min\{Q_{CH_4,y} ; BE_{CH_4,MCF,y}\}$$

#### Methane Conversion factor method ( $BE_{CH_4,MCF,y}$ ):

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

The quantity of chemical oxygen demand ( $COD_{BL,y}$ ) that would be treated in open lagoons is equal to the chemical oxygen demand ( $COD_{PJ,y}$ ) of the project activity is determined using equation 4 of ACM0014 version 05.0.0 /07/ and as follows:

$$COD_{BL,y} = \rho \left( 1 - \frac{COD_{out,x}}{COD_{in,x}} \right) \times COD_{PJ,y}$$

## VALIDATION REPORT

The project being a Greenfield project, discount factor for historical information ( $\rho$ ) is considered as 1 in line with the methodology **/07/**. COD of the effluent in the period  $x$  ( $COD_{out,x}$ ) is considered as 120 mg/l and COD directed to the open lagoons ( $COD_{in,x}$ ) (scenario 1 for this project activity) is taken as 42,000 mg/l as per the baseline report **/25/**.

As per equation 5 of the methodology **/07/**, Quantity of chemical oxygen demand that is treated in the anaerobic digester in the project activity ( $COD_{PJ,y}$ ) in year  $y$  (tCOD/yr) is determined as follows:

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

Quantity of wastewater that is treated in the anaerobic digester in the project activity ( $F_{PJ,dig,m}$ ) in month  $m$  ( $m^3$ /month) shall be monitored *ex-post* and *ex-ante* the design capacity (5,000  $m^3$ /day) has been considered in line with the baseline report **/25/** and the contract with technology supplier **/16/**.

Chemical oxygen demand in the wastewater that is treated in the anaerobic digester ( $COD_{dig,m}$ ) in the project activity in month  $m$  shall be monitored *ex-post*, and for *ex-ante* estimation the design parameter (42,000 mg/l) as per the baseline report **/25/** and the contract with technology supplier **/16/** has been considered.

Average baseline methane conversion factor (fraction) in year  $y$ , representing the fraction of ( $COD_{PJ,y} \times B_o$ ) that would be degraded to  $CH_4$  in the absence of the project activity ( $MCF_{BL,y}$ ) is determined as per equation 6 of the methodology **/07/** and as follows:

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

Since the depth of the baseline lagoon is estimated as 6m in the baseline study report **/25/**, the Factor expressing the influence of the depth of the lagoon ( $f_d$ ) is taken as 70% in line with the methodology **/07/**.

Factor expressing the influence of the temperature on the methane generation in year  $y$  ( $f_{T,y}$ ) shall be calculated following equation 11 of the methodology as follows:

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

Factor expressing the influence of the temperature on the methane generation in month  $m$  ( $f_{T,m}$ ) shall be estimated *ex-post* based on monitoring average temperature at the project site ( $T_{2,m}$ ) in month  $m$  (K) following the equation 10 of the methodology as below:

$$f_{T,m} = \begin{cases} 0 & \text{if } T_{2,m} < 278K \\ e^{\left(\frac{E \cdot (T_{2,m} - T_1)}{R \cdot T_1 \cdot T_{2,m}}\right)} & \text{if } 278K \leq T_{2,m} \leq 302.5K \\ 0.95 & \text{if } T_{2,m} > 302.5K \end{cases}$$

Where, activation energy constant ( $E$ ) as 15,175 cal/mol,  $T_1$  as 303.16 K (273.16 K + 30 K) and ideal gas constant ( $R$ ) as 1.987 cal/K mol) considered as default in line with the methodology **/07/**.

## VALIDATION REPORT

After the implementation of the project activity, quantity of methane produced in the digester ( $Q_{CH_4,y}$ ) shall be estimated following latest version of the tool “Project and leakage emissions from anaerobic digesters” and following the same option A of the ‘tool to determine the mass flow of a greenhouse gas in a gaseous stream’ equation 5 with monitored parameters.

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

The project activity does not involve electricity generation and hence, this is considered zero in the project activity,

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

The project activity involves heat generation utilizing the recovered biogas in a nearby limekiln boiler. However, the project activity does not intend to claim emissions reductions from heat generation. Hence, this is considered zero in the project activity.

Therefore, baseline emissions estimated ex-ante is 189,225 tCO<sub>2</sub>e per year.

### Project Emissions:

Sources of project emissions have been identified and they are in accordance with the adopted methodology /07/.

Total estimated project emissions as per ACM0014 version 05.0.0 are the sum of the below calculated in line with the tool ‘Project and leakage emissions from anaerobic digesters’:-

- i) Project emissions associated with the anaerobic digester ( $PE_{CH_4,y}$ );
- ii) Project emissions from flaring of biogas ( $PE_{flare,y}$ ); and
- iii) CO<sub>2</sub> emissions from consumption of electricity ( $PE_{EC,y}$ ) and/or fossil fuels ( $PE_{FC,y}$ )

### Project emissions from physical leakage of methane from the anaerobic digester ( $PE_{CH_4,y}$ ):

In line with the tool ‘Project and leakage emissions from anaerobic digesters’.  $PE_{CH_4,y}$  is estimated ex-ante to be 11,052 tCO<sub>2</sub>e annually. For ex-post determination purposes, the project emission will be calculated based on the parameters monitored.

### Project emissions from flaring of biogas generated ( $PE_{flare,y}$ ):

This emission shall be estimated in line with the tool ‘Project emissions from flaring’ /33/. Although, entire biogas generated shall be utilized in heat generation, there may be in emergency case an open flaring system shall be installed to flare the unutilized biogas. Calculations have been presented in the PDD /01/ and the emission reduction calculation spread sheet /02/. These calculations have been checked by RINA and found to be correct.

For ex-ante estimation purposes, the estimated project emission from flaring is taken as zero. For ex-post determination purposes, the project emission will be calculated based on the parameters monitored.

### Project emissions from land application of sludge ( $PE_{sludge,LA,y}$ ):

Ex-ante the emission is assumed as zero and for ex-post estimation the same shall be estimated following equation 16 of the methodology /07/.

### Project emissions from land application of wastewater:

This source of emission is disregarded as the land application of wastewater does not occur in the project activity.

### Project emissions from electricity consumption ( $PE_{EC,y}$ ):

This emission source is calculated using the latest approved version of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” /38/. Calculations have been presented in the PDD /01/ and the emission reduction calculation spread sheet /02/. These calculations have been checked by RINA and found to be correct.

For ex-ante estimation purposes, the estimated project emission calculated is 7,190 tCO<sub>2</sub>e annually. For ex-post determination purposes, the project emission will be calculated based on the parameters monitored.

## VALIDATION REPORT

### **Project emissions from fossil fuel consumption:**

This source of emission is not expected in the project activity and hence considered as zero.

The project emissions estimated ex-ante is 18,242 tCO<sub>2</sub>e annually.

### **Leakage Emissions:**

In line with the methodology leakage emissions are discussed as per tool 'Project and leakage emissions from anaerobic digesters' /34/. In that project activity, sludge or the digestate from the digester will be directly applied to land or provided to the farmers and will not be stored under anaerobic conditions at any point of time and hence ex-ante estimation is it assumed to be zero. However, this will be cross checked during the first verification period (FAR 1).

### **Emission Reductions:**

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average ex-ante estimation of emission reduction conservatively calculated to be 170,983 tCO<sub>2</sub>e per year. The calculation of the emission reductions has been ensured by the validation team based on the CER calculation sheet, version 03 /02/.

The emission reductions estimation can be replicated using the data and parameter values provided in the PDD and supporting file submitted for registration. The data sources mentioned have been verified by RINA. RINA confirms that the estimates provided in the revised PDD version 03.1/01/ are reasonable and the project participant has correctly applied the methodology; the calculations are complete and transparent and the data accuracy has been verified.

## **3.17 Environmental Impacts**

The host country of Thailand does not require the project activity to prepare an Environmental Impact Assessment (EIA). This is evidenced from the announcement by the Ministry of Natural Resource and Environment /67/. In line with the notification, the project activity got approval to construct and operate the project activity /47/.

The project is designed to ensure that the wastewater quality meets the discharge requirements of the host country /49/. Based on the Environmental Evaluation presented by the project proponent in the PDD /01/, the project carries no adverse environmental effects.

RINA has verified all the statutory clearances which include permission from Sub District Administrative Organization of Tathoom, Thailand /47/ and HCA from Ministry of Natural Resources and Environment; Kingdom of Thailand /41/. The validation team concludes that all the clearances obtained are in accordance with the procedures required by the host party and no significant environmental impacts are expected from the project activity.

## **3.18 Local stakeholders consultation**

Prior to the publication of the PDD version 01 /01/ on the UNFCCC website from 10/08/2012 to 08/09/2012, the project proponent invited local stakeholders through local newspaper advertisement on 09/05/2008 and also personnel invitation letters on 20/05/2008 and organized the local stakeholder consultation process on 23/05/2008 for the project activity /27/. Local villagers, employees of the technology supplier and local public representatives were present at the meeting. RINA cross checked the attendance list of stakeholders' /27/ and also interviewed some of the local stakeholders during site visit to confirm the consistency of the information provided in the PDD.

A summary of comments has been provided by PP and it is found that no adverse comment was received for the project activity /27/. This has also been verified by RINA validation team during site visit on 19/09/2012 by conducting a random stakeholder's meeting at the project site. Further, the interviewees confirmed that there was no adverse comment about the project and this project will lead to employment generation and better environmental conditions. RINA considers the local stakeholder consultation carried out adequately and can confirm that the process is credible.

## VALIDATION REPORT

### 4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

The PDD version 01 of 01/08/2012 **/01/** was made publicly available on the CDM UNFCCC website and Parties, stakeholders and NGOs through the CDM website (<https://cdm.unfccc.int/Projects/Validation/DB/5GDOZEFXKGLA3FGW3FGGEZH7DX7XHM/view.html>) invited to provide comments during a 30 days period from 10/08/2012 to 08/09/2012. No comments received during this period.

## VALIDATION REPORT

### 5 VALIDATION OPINION

RINA Services Spa (RINA) has performed validation of the project activity “Double A Ethanol wastewater treatment plant” in Thailand, with regard to the relevant requirements for CDM activities.

The review of the project design document and the subsequent follow-up interviews have provided RINA with sufficient evidence to determine the fulfillment of the stated criteria.

The host Party is Thailand and the Annex I Party is United Kingdom. Both Parties fulfill the participation criteria and have approved the project and authorized the project participant Double A Ethanol Company Limited and Climate Change Capital Limited. The DNA from Thailand confirmed that the project assists in achieving sustainable development.

The project correctly applies the approved baseline and monitoring methodology “ACM0014”, “treatment of wastewater”, version 5.0.0 of 20/07/2012.

The project involves methane recovery from wastewater treatment and recovered methane will be used for heat generation, thereby, results in reduction of CH<sub>4</sub> emissions and CO<sub>2</sub> emissions that are real, measurable and give long-term benefits to the mitigation of climate change. It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity. The emission reductions will be claimed only for CH<sub>4</sub> emissions for the proposed project activity..

The total emission reductions from the “Double A Ethanol wastewater treatment plant” are estimated to be on an average 170,983 tCO<sub>2</sub>e per year over the selected 10 years fixed crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The monitoring plan provides for the monitoring of the project’s emission reductions. The monitoring arrangements described in the monitoring plan are feasible within the project design and it is RINA’s opinion that the project participants are able to implement the monitoring plan.

In conclusion, it is RINA’s opinion that the project activity “Double A Ethanol wastewater treatment plant” in Thailand, as described in the PDD, version 03.1 of 27/12/2012, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology “ACM0014”, “treatment of wastewater”, version 05.0.0 of 20/07/2012.

RINA provides the validation opinion that the all of coverage for the project components or issues are deemed being validated through the validation process.

RINA thus requests registration of the project as a CDM project activity.

# **APPENDIX A**

## **VALIDATION PROTOCOL**

**TABLE 1 MANDATORY REQUIREMENTS**

Requirement	Reference	Conclusion
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reductions commitment under Art. 3.	Kyoto Protocol Art.12.2	OK
2. The project shall assist non Annex I Parties contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2	<del>CAR 1</del> , OK
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved	Kyoto Protocol Art.12.5a CDM Modalities and Procedures §40a	<del>CAR 1</del> , OK
4. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof.	Kyoto Protocol Art.12.2 CDM Modalities and Procedure §40	<del>CAR 1</del> , OK
5. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance (ODA) and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7 CDM Modalities and Procedures Appendix B §2	<del>CL 2</del> , OK
6. Parties participating in the CDM shall designate a national authority for the CDM	CDM Modalities and Procedures §29	OK
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities and Procedures §30/31a	OK
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedure §31b	OK
9. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	CDM Modalities and Procedure §31b	OK
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.	CDM Modalities and Procedure §43	<del>CAR 7, CAR 8, CAR 9, CAR 10, CL 5</del> , OK
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art.12.5b	<del>CAR 11, CAR 12, CAR 13</del> , OK
12. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	OK
13. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30/45 days, and the project design document and comments have been made publicly available.	CDM Modalities and Procedures §40	OK
14. Baseline and monitoring methodology shall be previously approved by the CDM	CDM Modalities and Procedures §37e	OK

Requirement	Reference	Conclusion
Methodology Panel.		
15. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §47	GL-3, OK
16. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords, and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	<del>CAR 15</del> , <del>CAR 16</del> , OK

**TABLE 2 REQUIREMENTS CHECKLIST**

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
<b>A Description of Project Activity</b>					
<b>A.1 Title of the project activity</b>					
A.1.1.	Does the used project title clearly enable the reader to identify the unique CDM activity? Is there an indication of a revision number and the date of the revision.	/01/	DR	Yes; as per the webhosted PDD, the title of the project activity in the PDD is "Double A Ethanol wastewater treatment plant" version 1.0, dated 01/08/2012. However, the PP is requested to submit the Letter of Approval from host country DNA	<b>CAR-1, OK</b>
A.1.2	Does the project comply with the applicable requirements for completing the PDDs (latest version available)?	/01/ /08/	DR/ CC	The PDD is not transparent on the following as per the latest "Guidelines for completing the project design document form", version 01.0, Annex 8 of EB 66 dated 02/03/2012.  <ol style="list-style-type: none"> <li>1. It is not mentioned in the PDD that PP (M/s Double A Ethanol Company Limited) is a public entity which is not correct as per the document review and site visit report.</li> <li>2. The project implementation details are not included in section A.1 of the PDD.</li> <li>3. The sections of the PDD are not in line with the "Project Design Document Form for CDM Project Activities (F-CDM-PDD)" version 04.1.</li> <li>4. The PDD is not consistent on the baseline fossil fuel.</li> <li>5. Post code number of Climate Change Capital Limited in Appendix-1 of the PDD is not mentioned</li> </ol>	<b>CAR-2, OK</b>
A.1.3	Does the PDD comply with the template available (latest version)?	/01/ /14/	DR/ CC	The PDD is based on the "Project Design Document Form for CDM Project Activities (F-CDM-PDD)" version 04.1,	<b>CAR-2, OK</b>

<sup>1</sup> MoV: DR document review, I interview, CC cross checking

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				dated 11/04/2012. However, please refer to section A.1.2 above.	
<b>A.2 Description of the proposed project activity</b>					
A.2.1	Does the PDD contain an accurate description of the project activity and provide the reader with a clear understanding of the precise nature of the project activity and the technical aspects of its implementation? How was the design of the project assessed?	/01/ /24/ /26/	DR/ CC	As per the PDD, the purpose of the project activity is to install a wastewater treatment plant with an anaerobic digester to recover biogas and utilize for heat generation. In the absence of the project activity wastewater would have been treated in an open anaerobic lagoon system leading to methane release into the atmosphere. The biogas shall be used for heat generation in a co-fired boiler of an adjacent limekiln where Bunker C oil is used. Therefore, the project will replace partial amount of bunker C oil that would be used otherwise for heat generation in the limekiln. However, the project activity does not intend to claim any emission reductions achieved from the saving of bunker fuel in the heat generation. The project technicalities are as per the proposal from Siemens Limited Thailand. During the site visit the validation team found that the wastewater plant is under construction and yet to be commissioned. It was told by project participant during discussion that the project plant is expected to be commissioned by end on February 2013.	<b>OK</b>
A.2.2	Does the project activity involve alteration of existing installations? If yes, have the differences between pre-project and post-project activity been clearly described in the PDD?	/01/ /16/ /17/ /18/ /19/ /20/ /21/ /22/ /23/	DR/ CC	The project activity is a Greenfield project. During the site visit, it was noted by the validation team that both ethanol plant and the wastewater plant is under construction and yet to be commissioned. Further, the contract between Siemens Limited Thailand and Double A Ethanol Company Limited also confirms that the project is a new one and does not involve alteration of existing installations.	<b>OK</b>
A.2.3	Is all information provided consistent and in compliance with the actual situation or planning?	/01/	DR/I	The information regarding the actual implementation status or planning of the project activity is not provided in the PDD transparently. Please refer to section A.1.2 above.	<b>GAR-2, OK</b>
<b>A.3 Project participants</b>					
A.3.1	Have the Parties and project participants participating	/01/	DR	As per the table provided in section A.4 of the PDD, the	<b>GAR-2, OK</b>

Checklist Question	Reference	MoV <sup>1</sup>	Comments	Conclusion
in the project been listed in tabular form in Section A.4 and are they consistent with the information detailed in Appendix 1 of the PDD?			host party involved is Thailand and the annex-1 party is United Kingdom and the project participants are M/s Double A Ethanol Company Limited and M/s Climate Change Capital Limited. The project participants name in section A.4 of the PDD is consistent with the information provided in Appendix-1 of the PDD. However, post code number of Climate Change Capital Limited in Appendix-1 of the PDD is not mentioned.	
A.3.2 Do all participating Parties fulfil the participation requirements as follows: (a) Party has ratified the Kyoto Protocol (b) Party has a Designated National Authority (c) The assigned amount has been determined	/01/ /12/ /13/	DR/ CC	Yes; the Annex-I party, United Kingdom ratified the Kyoto Protocol on 31/05/2002 and has appointed 'Environment Agency' as DNA. The Host party Thailand ratified the Kyoto Protocol on 28/08/2002 and has appointed 'Thailand Greenhouse Gas Management Organization (TGO)' as DNA. No assigned amount has been determined for the host party, whereas for the Annex I party, assigned amount has been determined.	<b>OK</b>
A.3.3 Have the letters of approval have been issued?	/01/	DR	The letter of approval from host country DNA is not yet available. The PP is requested to provide the same.	<del>CAR-1</del> , <b>OK</b>
A.3.4 Do the letters of approval meet the following requirements? (a) LoA(s) is/are issued by the DNA (b) LoA confirms that the Party has ratified the Kyoto Protocol; (c) LoA confirms that participation is voluntary (d) The LoA confirms that the project contributes to the sustainable development of the Host Country? (e) The LoA is valid for the proposed project activity under validation (f) The LoA was received directly by the DNA or by the PP	/01/	DR	Please refer to section A.3.3 of this protocol.	<del>CAR-1</del> , <b>OK</b>
A.3.5 Indicate the means of validation employed to assess the authenticity	/01/	DR	The letter of approval from host country DNA and Annex-I party are not yet available. The PP is requested to provide the same.	<del>CAR-1</del> , <b>OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
A.3.6	Have all private/public project participants been authorized by a Party to the Kyoto Protocol?	/01/	DR	Please refer to section A.3.3 of this protocol.	<b>CAR-1, OK</b>
A.3.7	Are the entities included in the PDD those authorized as PPs?	/01/	DR	The letter of approval from host country DNA is not yet available. The PP is requested to provide the same.	<b>CAR-1, OK</b>
A.3.8	Do the PP(s) listed in the PDD have a contract with RINA for the project validation?	/01/ /28/	DR	Yes; The PP (M/s Climate Change Capital Limited) has entered ton an agreement with RINA for validation of the project activity.	<b>OK</b>
<b>A.4 Modalities of communication</b>					
A.4.1	Does the MoC statement comply with the latest version of the Form F-CDM-MOC available?	/29/	DR	PP is requested to submit the latest version of the Modalities of Communication statement (F-CDM-MOC) and documentary evidence to check the authenticity of the signing authority.	<b>CAR-3, OK</b>
A.4.2	Does the MoC statement is correctly completed including Annex 1?	/29/	DR	Please refer to section A.4.1 above.	<b>CAR-3, OK</b>
A.4.3	Does the MoC statement identify all PPs and focal points?	/29/	DR	Please refer to section A.4.1 above.	<b>CAR-3, OK</b>
A.4.4	How the personal identities, the specimen signatures and the employment status is cross-checked?	/29/	DR	Please refer to section A.4.1 above.	<b>CAR-3, OK</b>
A.4.5	Is the official who submitted the MoC statement and the official who signed the written confirmation duly authorized to do so on behalf of the respective PPs?	/29/	DR	Please refer to section A.4.1 above.	<b>CAR-3, OK</b>
<b>A.5 Technical description of the project</b>					
A.5.1	Does the information provided on the location of the project activity allow for a clear identification of the site(s)? Are the latitude and longitude of the site indicated (decimal points)?	/01/ /23/	DR	The project location is clearly described in the PDD and is also in line with the location described in the contract copy signed between M/s Siemens Limited Thailand and M/s Double A Ethanol Company Limited. However, the GPS coordinates presented in the PDD are not correct when checked with GPS device during the site visit. PP is requested to provide the correct GPS coordinates in degree, minutes and seconds and also in decimals.	<b>CAR-4, OK</b>
A.5.2	Is the category(ies) of the project activity correctly identified?	/01/	DR	Yes; the projects falls under Sectoral Scope: 13 (waste handling and disposal) and correctly applies the methodology ACM0014 version 05.0.0	<b>OK</b>
A.5.3	Does the project design engineering reflect current	/01/	DR/	The project design engineering reflects good practices as it is meant to capture methane emissions that would have	<b>CAR-5, OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
	good practices? Would the technology result in a significantly better performance than any commonly used technologies in the host Country? Is any transfer of technology from any Annex I Party involved?	/23/ /24/ /26/	CC	<p>been released to atmosphere from the anaerobic lagoons and utilizes it to generate heat energy. This is superior to the prevailing practice of allowing methane emissions to escape into the atmosphere.</p> <p>Under the project activity, the ethanol plant is expected to generate 5,000 m<sup>3</sup>/day of wastewater with a typical COD of 42,000 mg/litre. The removal rate of COD is 90% and it is expected that the IC reactor treatment stage can recover 59,505 m<sup>3</sup> of methane per day. Biogas of 71,732m<sup>3</sup>/day is expected to generate from the project activity. The project technicalities are as per the proposal from Siemens Limited Thailand.</p> <p>SAR anaerobic digester system is an advanced technology which enables effective use of the industrial wastewater compared to traditional open lagoon system. The technology is supplied by Siemens Limited Thailand and hence confirmed that the technology is available in the host country and not transferred from any Annex-I country. This is confirmed from the contract documents with technology supplier. However, section A.3 should include the age and average lifetime of the equipment based on manufacturer's specifications as per the PDD guideline. Also the flare specifications are missing in the section.</p>	
A.5.4	What is the expected operational lifetime of the project activity? Is it reasonable?	/01/	DR	As per the PDD, the operation lifetime of the project activity is 15 years. However, PP is requested to provide supporting document for the same.	<b>CL-1, OK</b>
<b>A.6 Public funding</b>					
A.6.1	Does the information on public funding provided conform to the actual situation or planning as presented by the PPs?	/01/	DR	As per the project PDD, the project activity does not involve any public funding. However, PP is requested to provide documentary evidence for the source of funding of the proposed project activity.	<b>CL-2, OK</b>
A.6.2	If public funding from Parties included in Annex I is used for the project activity, have these Parties provided an affirmation that such funding does not	/01/	DR	Please refer to section A.6.1 above.	<b>CL-2, OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion						
	result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties?										
B. Baseline and monitoring methodology											
B.1 Methodology applied											
B.1.1	Does the project activity apply an approved methodology and the correct version thereof?	/01/ /07/	DR	Yes; the project activity correctly applies the approved methodology ACM0014 “treatment of wastewater” version 05.0.0 of EB 68 dated 20/07/2012.	OK						
B.1.2	Is there any specific guidance, including the methodological tools provided by EB and has these guidance been applied?	/01/ /07/ /32/ /33/ /34/ /35/ /36/ /37/ /38/	DR	Yes; the following tools and guidelines are correctly applied in the project activity as referred by the methodology: <ul style="list-style-type: none"><li>- Tool for the demonstration and assessment of additionality (Version 06.0)</li><li>- Project emissions from flaring ( Version 2.0.0)</li><li>- Project and leakage emissions from anaerobic digesters (01.0.0)</li><li>- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (2.0.0)</li><li>- Tool to calculate project or leakage CO<sub>2</sub> emissions from fossil fuel combustion (Version 02)</li><li>- Tool to calculate the emission factor for an electricity system (Version 02.2.1)</li><li>- Tool to calculate baseline, project and/or leakage emission from electricity consumption (Version 01)</li></ul>	OK						
B.1.3	How was it validated that the project activity complies with the applicability criteria?	/01/ /07/	DR/ CC	<table><tr><th>Applicability criteria</th><th>Project activity</th><th>Criteria is met?</th></tr><tr><td>The wastewater is not treated, but directed to open lagoons that have clearly anaerobic conditions. In cases where solid materials are separated before</td><td>In the project activity, wastewater is treated in a new anaerobic digester. The project activity is a Greenfield project. In the</td><td>The project activity and baseline scenario are not transparen</td></tr></table>	Applicability criteria	Project activity	Criteria is met?	The wastewater is not treated, but directed to open lagoons that have clearly anaerobic conditions. In cases where solid materials are separated before	In the project activity, wastewater is treated in a new anaerobic digester. The project activity is a Greenfield project. In the	The project activity and baseline scenario are not transparen	CAR-6, OK
Applicability criteria	Project activity	Criteria is met?									
The wastewater is not treated, but directed to open lagoons that have clearly anaerobic conditions. In cases where solid materials are separated before	In the project activity, wastewater is treated in a new anaerobic digester. The project activity is a Greenfield project. In the	The project activity and baseline scenario are not transparen									

Checklist Question		Reference	MoV <sup>1</sup>	Comments			Conclusion
				directing the wastewater to the open lagoons, the solid materials have a different treatment than the wastewater.	absence of the project activity the wastewater would have been released in the open lagoon. The biogas extracted from the digester shall be used for heat energy generation.	tly described for scenario 1 of the methodology applicability condition.	
				The wastewater is treated in a wastewater treatment plant. Sludge is generated from primary and/or secondary settlers. The sludge is directed to sludge pit(s) that have clearly anaerobic conditions.	The project activity is a new project activity and there was no wastewater treatment plant in the baseline scenario.	Not applicable for the project activity. However, the PDD is not transparently describes the same.	
				The average depth of the open lagoons or sludge pits in the baseline scenario is at least 1m.	As per the PDD, the depth of anaerobic open lagoons in the absence of the project activity would be 7 m.	PP is requested to provide basis of the statement.	
				The residence time of the organic matter in the open lagoon or sludge pit system should be at least 30 days.	As per the PDD, the residence time of the organic matter in baseline scenario is 70 days.	PP is requested to provide basis of the statement.	
				Inclusion of solid	The project activity	Yes;	

Checklist Question	Reference	MoV <sup>1</sup>	Comments			Conclusion
			materials in the project activity is only applicable where: (i) Such solid materials are generated by the industrial facility producing the wastewater; and (ii) The solid materials would be generated both in the project and in the baseline scenario.	is not meant to include solid material in the anaerobic digester system.	however, PP is requested to provide supporting evidence for the same.	
			The sludge produced during the implementation of the project activity is not stored onsite before land application to avoid any possible methane emissions from anaerobic degradation.	Sludge produced onsite during the implementation of the project activity will be immediately disposed for land application and will not be stored at any point of time in the project activity.	Yes; however, PP is requested to provide supporting evidence for the statement since as per section A.3 of the PDD sludge will be transferred to a storage area.	
			PP is requested to clarify what stands for EQ in the flow diagram in figure B2.1 of the PDD and also requested to provide the basis on which the flow diagram of the			

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				wastewater treatment plant in the absence of the project activity has been outlined.	
B.1.4	Is the selected baseline one of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/01/ /07/	DR	As per the PDD, the selected baseline is use of open lagoon system and fossil fuel consumption for heat generation. This is in line with the methodology and hence confirms the applicability of the methodology. However, please refer to section B.1.3 above.	<b>CAR-6, OK</b>
<b>B.2 Project boundary</b>					
B.2.1	Is the project boundary are clearly defined and in accordance with the applied methodology?	/01/ /07/	DR	The description of the project boundary is not transparent in the PDD. PP is requested to clarify why the site where any sludge/dewatered wastewater applied and heat generating equipments are not included in the project boundary. The grid electricity consumption (project emissions) is not reflecting in the project boundary diagram. Also table B.3.1 shows that electricity is not included in the baseline scenario, whereas table B4.1 shows that electricity is being consumed in the baseline scenario. Further, the monitoring points are not highlighted in the flow diagram of the project boundary.	<b>CAR-7, OK</b>
B.2.2	What are the project's system boundaries (components and facilities used to mitigate GHGs)?	/01/ /07/	DR// CC	The project's system boundaries include the anaerobic bioreactor, the flare system and the land application of sludge. However, please refer to section B.2.1 above.	<b>CAR-7, OK</b>
B.2.3	Which sources are identified for the project? Does the identified project boundary cover all possible sources linked to the project activity?	/01/ /07/	DR// CC	Identified GHG sources are CH <sub>4</sub> from the treated wastewater, N <sub>2</sub> O from land application of sludge and CO <sub>2</sub> from the grid electricity consumption. However, please refer to section B.2.1 above. It is also noted that the biogas replaces the bunker oil only partially in the boiler and thus the emissions from the bunker oil consumption are not transparent in the project boundary.	<b>CAR-7, OK</b>
B.2.4	In case of grid connected electricity project: is the relevant grid correctly identified in accordance with the latest version of tool to calculate emission factor of electricity system and the underlying methodology?	/01/ /07/	DR	The project activity does not intend to generate electricity and supply to grid. Hence, not applicable to the project activity.	<b>OK</b>
B.2.5	Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources	/01/	DR	The validation did not reveal any other emission sources, which may contribute to more than 1% to the estimated emission reductions of the project activity.	<b>OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
	contribute by more than 1% to the estimated emission reductions of the project?				
<b>B.3 Identification of the Baseline Scenario</b>					
B.3.1	Which baseline scenarios have been identified? Is the list of the baseline scenarios complete? Does the PDD follow the steps to determine the baseline scenario required by the methodology/tool?	/01/ /07/	DR	<p>Identified baseline scenarios are as follows:  W1: The use of open lagoons for the treatment of the wastewater;  W2: Direct release of wastewater to a nearby water body;  W3: Aerobic wastewater treatment facilities (e.g. activated sludge or filter bed type treatment);  W4: Anaerobic digester with methane recovery and flaring;  W5: Anaerobic digester with methane recovery and utilization for electricity or heat generation;  W6: Wastewater is directed to land application without dewatering;  W7: Wastewater is dewatered and directed to land application/used as fuel in energy applications.</p> <p>The project activity does not intend to utilize the biogas for electricity generation and hence alternatives of electricity generation have not been discussed in the PDD. However, since the project activity includes heat generation with biogas from a new anaerobic digester, plausible alternatives include:  H1: Co-generation of heat using fossil fuels in a captive cogeneration power plant  H2: Heat generation using fossil fuels in a boiler;  H3: Heat generation using renewable sources.</p> <p>Further, treatment of solid materials (SM) is not included in the project activity; hence, no alternatives have been identified.</p> <p>The alternatives identified are in line with the methodology following step wise approach and are deemed complete.</p>	<b>OK</b>
B.3.2	How have the other baseline scenarios been eliminated in order to determine the baseline?	/01/ /07/	DR	PP has followed step-wise approach as per ACM0014 version 05.0.0 and referred "tool for the demonstration and assessment of additionality".	<b>CL3, OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				<p>PP has identified alternatives as discussed in section B.3.1 above. Step-wise approach has been followed to eliminate other baseline scenarios considering legal requirements, investment barrier and economic attractiveness. However, please explain the following and provide credible reference where necessary:</p> <ol style="list-style-type: none"> <li>1. PP is requested to provide credible evidence based on which design parameters of a particular wastewater stream has been identified in table B4.1 of the PDD. Also clarify why only one design option has been identified.</li> <li>2. PP is requested to provide the reference document for footnote 11, 12, 13 and clarify how lagoon depth of 6 meter is considered appropriate and further Annex 3 is not included in the PDD as referred in footnote 8 of the PDD.</li> <li>3. Provide credible source based on which it is stated that there is no national and/or sectoral policies or regulations before 11 December 1997 that give comparative advantages to more emissions-intensive technologies or fuels over less emissions-intensive technologies or fuels in local area and there is no national and/or sectoral policies or regulations after November 11th, 2001 that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs) in the local area.</li> <li>4. PP is requested to provide copy of the notification of Ministry of Science, Technology and Environment issue no. 3, B.E.2539.</li> </ol>	
B.3.3	What is the baseline scenario? Is the determination of the baseline scenario in accordance with the guidance	/01/ /07/	DR/ CC	<p>The baseline of the project activity is as follows: W1: The use of open lagoons for the treatment of the</p>	<b>OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
	in the methodology?			wastewater, and H2: Heat generation using fossil fuels in a boiler.  The identified baseline is in accordance of the methodology.	
B.3.4	Has the baseline scenario been determined using conservative assumptions? Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies (E+ / E-), macro-economic trends and political aspirations?	/01/ /07/	DR	Please refer to section B.3.2 above.	<del>CL</del> 3, OK
<b>B.4 Additionality</b>					
B.4.1	What tool does the project use to assess additionality? Is this in line with the methodology?	/01/ /07/ /09/	DR	The project additionality is discussed as per “tool for the demonstration and assessment of additionality” version 06.0.0. This is in line with the methodology.	OK
B.4.2	What is the project additionality mainly based on?	/01/ /07/ /09/ /30/	DR/ CC	The PP has demonstrated the project additionality as per the investment analysis of the “tool for the demonstration and assessment of additionality” version 06.0.0. And in doing so, PP has referred to the “Guidelines on the assessment of investment analysis” version 05, Annex 05 of EB 62 dated 15/07/2011. PP opted for investment comparison analysis and has chosen NPV as the financial indicator.	OK
<b>B.4.3 Prior consideration of CDM</b>					
B.4.3.1	What is the starting date of the proposed project activity? Is it in accordance with the CDM Glossary of Terms?	/01/ /11/ /17/	DR/ CC	As per section C.1.1 of the PDD, the start date of the project activity is 24/12/2007 which is the date of signing the EPC agreement between the project proponent (M/s Double A Ethanol Company Limited) and technology supplier (M/s Siemens Limited Thailand). The validation team has cross checked the copy of the EPC agreement and found that the start date justification is appropriate as per the “Glossary of CDM terms” version 06 dated 02/03/2012	OK
B.4.3.2	Is the project activity a new project activity or existing project?	/01/ /17/	DR/ CC	The project is a green-field project activity; however the start date is prior to 2 August 2008. This has been confirmed from the EPC agreement between the project	OK

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				proponent (M/s Double A Ethanol Company Limited) and the technology supplier (M/s Siemens Limited Thailand).	
B.4.3.3	For an existing project activity with a start date is prior the date of the PDD publication for GSC, what is the evidence for serious consideration of CDM prior to the time of decision to proceed with the project activity?	/01/ /05/ /17/ /27/	DR/ CC	<p>The start date of the project activity is 24/12/2007 which is prior to the date of publication of the PDD for GSP on 10/08/2012. Therefore, in accordance of paragraph 28 of "Clean Development Mechanism Project Standard", version 01.0, project participants shall demonstrate that CDM was seriously considered in the decision to implement the proposed project activity. This is discussed below:</p> <ol style="list-style-type: none"> <li>1. In line with paragraph 28 (a) of "Clean Development Mechanism Project Standard", version 01.0, PP (M/s Double A Ethanol Company Limited) considered the project activity in its Board Meetings dated 06/02/2007 and dated 19/11/2007 which is before the start date of the project activity. The validation team has checked the original Board notes are confirms that the project activity was considered before the start date. Hence, it is concluded that PP was aware of CDM prior to start of the project activity. However, in the PDD chronology is not made transparent in order of its events.</li> <li>2. In line with paragraph 28 (b) of "Clean Development Mechanism Project Standard", version 01.0, PP (M/s Double A Ethanol Company Limited) signed the CDM development mandate letter on 01/02/2008 and conducted the local stakeholder consultation meeting on 23/05/2008. However, PP is requested to submit the copy of the CDM development mandate letter dated 01/02/2008 signed by PP (M/s Double A Ethanol Company Limited). In addition, PP is requested to provide the documentary evidence for the negotiations taken for CDM development and CER sales in March 2010, term sheet sent to project owner dated 29/07/2011 and the revised mandate letter signed on 23/01/2012.</li> </ol>	<b>CL-4, OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				.	
B.4.3.4	Does the timeline of the project confirm that continuous actions in parallel with the implementation were taken to secure CDM status? Please specify the gap between the documented evidences.	/01/ /05/ /17/ /27/	DR/ CC	Please refer to section B.4.3.2 above.	<b>CL-4, OK</b>
<b>B.4.4 Investment analysis</b>					
B.4.4.1	What is the analysis method used to determine whether the proposed project activity is not (a) the most economically or financially attractive; or (b) economically or financially feasible, without the revenue from the sale of certified emission reductions?	/01/ /03/ /09/ /30/	DR/ CC	The PP has applied investment comparison analysis and calculated the NPV for the project activity. The approach is in line with the ‘tool for the demonstration and assessment of additionality’. Simple cost analysis is not applicable since the project generates revenue in terms of saving of bunker fuel for heat generation. Further, as per the ‘guidelines on the assessment of investment analysis’ if the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same (or substitute) products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. Hence, investment comparison analysis with NPV calculation is considered appropriate. However, PDD is referring the wrong paragraph of the investment analysis guideline in section B.5 of the PDD.	<b>CAR-8, OK</b>
B.4.4.2	What the financial indicator is used?	/01/ /03/ /09/	DR/ CC	NPV is chosen as financial indicator. The financial indicator is appropriate for the type of project activity as per the ‘tool for the demonstration and assessment of additionality’	<b>OK</b>
B.4.4.3	If a benchmark is used, is it ensured that it is selected in accordance with the requirements of the EB guidelines and it represents standard returns in the market?  Is the benchmark suitable for the type of financial indicator presented?  Is it ensured the any risk premiums applied in determining the benchmark reflect the risks associated with the project type or activity?	/01/	DR	Benchmark approach is not applied in the project activity. Hence, not applicable for the project activity.	<b>OK</b>
B.4.4.4	Is the investment analysis carried out in accordance	/01/	DR/	PP has considered investment comparison analysis method	<b>OK</b>

Checklist Question	Reference	MoV <sup>1</sup>	Comments	Conclusion
<p>with specific guidance from EB?</p> <p>Is the investment analysis complete and accurate?</p> <p>Is the investment analysis provided in a spreadsheet version? Are all the formulas used readable and all relevant cell be viewable and unprotected?</p>	<p>/03/</p> <p>/09/</p> <p>/30/</p>	<p>CC</p>	<p>in line with the additionality tool and EB guideline "Guidelines on the assessment of the investment analysis" (Version 05, EB 62). As per the guideline 'if the proposed baseline scenario leaves the project participant no other choice than to make an investment to supply the same products or services, a benchmark analysis is not appropriate and an investment comparison analysis shall be used. The investment analysis is provided in a spreadsheet and all formulas used are readable and unprotected.</p>	
<p>B.4.4.5 Cross-check the parameters used in the financial analysis against third party or publicly available sources (all parameters used as input values shall be cross-checked and assessed).</p>	<p>/01/</p> <p>/03/</p>	<p>DR/</p> <p>CC</p>	<p>Input parameters used in the financial analysis are crossed checked against credible sources (third party or publicly available documents). However, PP is requested to clarify the following:</p> <ol style="list-style-type: none"> <li>1. Provide exact reference of the interest rate considered as 7.99% for the open lagoon system in consideration of investment decision.</li> <li>2. Provide exact reference for the tax rate considered as 30% in case of the open lagoon system applicable at the time of investment decision. Kindly provide the method of computation of income for tax purposes as per the local rules.</li> <li>3. Provide the source for the fuel price considered for revenue calculation. Also, kindly provide the current price of fuel.</li> <li>4. Provide the proposal for laboratory cost considered in operating cost. Kindly provide the source and evidence for PAM price, PAM consumption, caustic soda price, caustic soda consumption, electricity price, electricity consumption, water price, water consumption.</li> <li>5. Provide the basis for the maintenance cost</li> </ol>	<p><b>CAR-8, GL-5, OK</b></p>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				<p>calculation. Kindly explain the basis for dividing the cost by 15 for each year maintenance cost calculation.</p> <p>6. Provide the offer letter from the supplier for the project cost considered. Kindly provide the actual cost details with invoices raised.</p> <p>7. Provide the basis for considering the life of the asset for 15 years.</p> <p>8. Provide the basis for depreciation calculation.</p> <p>9. Provide the basis for the interest rate, tenure of loan, grace period and the basis for the D/E ratio. Kindly explain the calculation of loan amount.</p> <p>10. Provide the loan sanction letter and current status of loan.</p> <p>In addition, the following are requested to explain:</p> <p>1. The PDD does not have the detailed input values with source.</p> <p>2. Please explain the reason for considering ethanol production days taken 5000 and 330 days per year separately and the calculation of operation and maintenance cost for open lagoon system.</p>	
B.4.4.6	Are the input values used in the investment analysis valid and applicable at the time of the investment decision taken by the PP?	/01/ /03/	DR/ CC	Please refer to section B.4.4.5 above.	<b>CAR-8, CL-5, OK</b>
B.4.4.7	Where applicable, the PFL has been defined ex-ante according to the applicable EB guideline?	/01/ /03/	DR/ CC	Biogas generation was estimated based on the system provider's projection in the proposal. This is reasonable and conservative. They are transparently documented in the	<b>OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				spreadsheet.	
B.4.4.8	Does the time period of the investment analysis reflect the expected operation of the underlying project activity (technical lifetime)?	/01/ /03/	DR	Yes; the investment analysis is carried out for 15 years which is also the operational life of the project activity as per the PDD. However, PP is requested to provide the supporting document for the operational life of the project activity.	<b>CL-1, OK</b>
B.4.4.9	Does the fair value of the project activity assets is included at the end of the assessment period as a cashflow in the final year?  Is the fair value calculated in accordance with local accounting regulations where available or international best practice?	/01/ /03/	DR	Please refer to section B.4.4.5 above.	<b>CAR-8, CL 5</b>
B.4.4.10	Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with normal accounting practice in the Host Country	/01/ /03/	DR	Please refer to section B.4.4.5 above.	<b>CAR-8, CL-5, OK</b>
B.4.4.11	Sensitivity analysis: have the key parameters contributing to more than 20% of the revenue/costs during operating or implementation been identified?	/01/ /03/ /30/	DR/ CC	Yes; the sensitivity analysis considers main parameters such as project cost, savings of fossil fuel and O & M cost which either constitute 20% of cost or revenue. This is in line with the "guidelines on the assessment of investment analysis" version 05, annex 5 of EB 62.	<b>OK</b>
B.4.4.11	Sensitivity analysis: is the range of variations is reasonable in the project activity?  The main parameters can be changed for the different project category.	/01/ /03/	DR/ CC	PP is requested to justify the sensitivity range of $\pm 10\%$ with actual values of input parameters. Further, the PDD does not describe the required variations of key parameters to reach the benchmark and the possibility of happening of the same. In addition, please explain the followings: 1. For O & M cost sensitivity, revenue has been affected with sensitivity, kindly rectify the same. 2. For project cost sensitivity, depreciation, maintenance cost and interest is not affected.	<b>CAR-9, OK</b>
B.4.4.12	Have the key parameters been varied to reach the benchmark and the likelihood of this happening been justified to be small?	/01/	DR	Please refer to section B.4.4.11 above.	<b>CAR-9, OK</b>
<b>B.4.5 Barrier analysis</b>					
B.4.5.1	Are the barriers identified complimentary to a potential investment analysis?	/01/09/	DR/ CC	Since, step 3 (Barrier analysis) of the "tool for the demonstration and assessment of additionality" is optional if	<b>OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				step 2 (Investment analysis) is followed. Hence, PP has not discussed barrier analysis in the PDD. This is in line with the applied tool and hence accepted by the validation team.	
B.4.5.2	How were the investment barriers assessed to be real?	/01/	DR	Barrier analysis is not carried out in the project activity. Hence, not applicable to discuss in this section.	OK
	How were the technological barriers assessed to be real?	/01/	DR	Barrier analysis is not carried out in the project activity. Hence, not applicable to discuss in this section.	OK
B.4.5.3	How were the other barriers assessed to be real?	/01/	DR	Barrier analysis is not carried out in the project activity. Hence, not applicable to discuss in this section.	OK
B.4.5.4	Barriers due to prevailing practice (First of its kind): does the project apply measures currently covered in the framework (fuel and feedstock switch, switch of technology with or without change of energy source, methane destruction, methane formation avoidance)?	/01/	DR	Barrier analysis is not carried out in the project activity. Hence, not applicable to discuss in this section.	OK
B.4.5.5	Barriers due to prevailing practice (First of its kind): do the technologies deliver the same output and differ by at least of energy source/fuel, feed stock, size of installation?	/01/	DR	Barrier analysis is not carried out in the project activity. Hence, not applicable to discuss in this section.	OK
B.4.5.6	Barriers due to prevailing practice (First of its kind): does the applicable geographical area is in compliance with the definition as per the EB guideline?	/01/	DR	Barrier analysis is not carried out in the project activity. Hence, not applicable to discuss in this section.	OK
B.4.5.7	Is the project activity prevented by the identified barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/01/	DR	Barrier analysis is not carried out in the project activity. Hence, not applicable to discuss in this section.	OK
B.4.5.8	How the CDM can alleviate the identified barriers?	/01/	DR	Barrier analysis is not carried out in the project activity. Hence, not applicable to discuss in this section.	OK
<b>B.4.6 Common practice analysis</b>					
B.4.6.1	Does the project apply measures currently covered in the framework (fuel and feedstock switch, switch of technology with or without change of energy source, methane destruction, methane formation avoidance)?	/01/ /09/ /39/	DR/ CC	Yes; the project falls under “methane destruction and methane formation avoidance” measures as covered in the framework.	OK
B.4.6.2	Do the technologies deliver the same output and differ	/01/	DR/	The PDD is not transparent on the different technologies in	<del>CAR-10</del> , OK

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
	by at least of energy source/fuel, feed stock, size of installation, investment climate in the date of the investment decision, other features?	/09/ /39/	CC	the context of common practice as per the “tool for the demonstration and assessment of additionality”.	
B.4.6.3	Does the applicable geographical area is in compliance with the definition as per the EB guideline?	/01/ /09/	DR/ CC	PP has considered host country (Thailand) as applicable geographical area which is default applicable geographical area as per the “tool for the demonstration and assessment of additionality”.	<b>OK</b>
B.4.6.4	How many similar non-CDM-projects exist in the region within the scope? (describe how the steps of the additionality tool have been applied)	/01/ /09/ /40/	DR	PP has discussed the common practice in stepwise as per the “tool for the demonstration and assessment of additionality”. However, please explain: <ol style="list-style-type: none"> <li>1. How the output range of 250 to 750 million liter of ethanol per year has been calculated. Ethanol production capacity of different plants listed in step 2 of the common practice mention ‘liter/year’ whereas the source document shows the unit in ‘liter/day’.</li> <li>2. Please explain how <math>N_{all}</math> have been arrived at 2.</li> <li>3. Step 3 is not transparently described how <math>N_{diff}</math> has been arrived at 2. How the plants with different technologies have been identified.</li> </ol>	<b>CAR-11, OK</b>
B.4.6.5	What is the data source(s) used for the common practice analysis?	/01/40/	DR	Please refer to section B.4.6.4 above.	<b>CAR-11, OK</b>
<b>B.4.7 Conclusion</b>					
B.4.7.1	What is the conclusion with regard to the additionality of the project activity?			The project additionality shall be concluded after satisfactory conclusion of CAR 8, CAR 9, CAR 10, CAR 11 and CL 5	<b>CAR-8, CAR 9, CAR-10, CAR-11, CL 5, OK</b>
<b>B.5 Algorithms and/or formulae used to determine emission reductions</b>					
<b>B.5.1 Baseline emissions</b>					
B.5.1.1	Are the steps and equations applied to calculate the baseline emissions in compliance with the requirements of selected baseline and monitoring	/01/ /02/ /07/	DR/ CC	Yes; the baseline emissions are calculated in the PDD as per ACM0014, version 05.0.0 and equations are outlined in section B.6.1. However, PP is requested to explain the	<b>CAR-12, OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
	methodology?			<p>following:</p> <ol style="list-style-type: none"> <li>1. The detailed ex-ante calculations of baseline emissions in line with the equations presented in section B.6.1 of the PDD are not presented in section B.6.3 of the PDD.</li> <li>2. Source of assumptions used in the ER calculation worksheet has not been provided. PP is requested to provide exact reference of all data assumptions.</li> <li>3. Calculation procedure of <math>Q_{CH_4, y}</math> is not included in the PDD.</li> <li>4. PP to explain the choice of <math>f_d</math> value in section B.6.2 of the PDD.</li> <li>5. Kindly provide more details how the average temperature at the project site has been considered.</li> <li>6. In the calculation of <math>f_{T,m}</math>, please explain why the minimum temperature limit is kept as 283K when the methodology specify it as 278K. Further, PP is requested to maintain the values up-to decimals as per the methodology.</li> <li>7. Why discount factor for historical information (<math>\rho</math>) is not included in the ER worksheet.</li> </ol>	
B.5.1.2	<p>Have conservative assumptions been used when calculating the baseline emissions and are the uncertainty estimates properly addressed?</p> <p>Are all the values used in the PDD considered reasonable in the context of the proposed project activity?</p>	/01/ /02/ /07/	DR/ CC	The baseline emissions are estimated in line with the approved methodology. However, please refer to section B.5.1.1 above.	<del>CAR-12</del> , OK
B.5.1.3	Baseline Emissions estimated (in case of different components applied please make them transparent).	/01/ /02/	DR	Baseline emissions estimated ex-ante is 188,571tCO <sub>2</sub> /year. However, please refer to section B.5.1.1 above.	<del>CAR-12</del> , OK
<b>B.5.2 Project emissions</b>					
B.5.2.1	Are the steps and equations applied to calculate the	/01/	DR/	Yes; project emissions are discussed as per applied	<del>CAR-13</del> , OK

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
	<p>project emissions in compliance with the requirements of selected baseline and monitoring methodology?</p> <p>Are all the values used in the PDD considered reasonable in the context of the proposed project activity?</p>	/02/ /07/	CC	<p>methodology ACM0002, version 13.0.0. However, PP is requested to explain the followings.</p> <ol style="list-style-type: none"> <li>1. Please explain what does the statement “<i>Error! Reference source not found</i>” means in the calculation of project emissions under section B.6.1.</li> <li>2. Provide the exact source for grid combined margin emission factor considered for the project activity.</li> <li>3. Please note that flare efficiency in case of open flares in the minute <math>m</math> (<math>\eta_{\text{flare},m}</math>) is 50% when the flame is detected in the minute <math>m</math> (<math>f_{\text{flame},m}</math>), otherwise <math>\eta_{\text{flare},m}</math> is 50%. This is not transparent in the PDD.</li> <li>4. It is not transparent in the PDD what does ‘flaring tool’ refer to while determining the mass flow of the gaseous stream in page 31 of the PDD.</li> <li>5. Calculation formula of project emissions from flaring (page 33 of the PDD) is not in line with the tool “project emissions from flaring”.</li> </ol>	
B.5.2.2	Have conservative assumptions been used when calculating the project emissions and are the uncertainty estimates properly addressed?	/01/ /02/ /07/	DR/ CC	The project emissions are estimated in line with the approved methodology. However, please refer to section B.5.2.1 above.	<del>CAR-13</del> , OK
B.5.2.3	Project emissions estimated	/01/ /02/ /07/	DR/ CC	Project emissions are estimated ex-ante as 10,525tCO <sub>2</sub> /year. However, please refer to section B.5.2.1 above.	<del>CAR-13</del> , OK
<b>B.5.3 Leakage</b>					
B.5.3.1	<p>Are the steps and equations applied to calculate the leakage in compliance with the requirements of selected baseline and monitoring methodology?</p> <p>Are all the values used in the PDD considered reasonable in the context of the proposed project activity?</p>	/01/ /02/ /07/	DR/ CC	As per the methodology, leakage emissions have to be estimated as per the tool “project and leakage emissions from anaerobic digesters”. However, PP is requested to explain how the leakage emissions are estimated as zero in line with the methodology.	<del>CAR-14</del> , OK
B.5.3.2	Have conservative assumptions been used when calculating the leakage and are the uncertainty	/01/ /02/	DR/ CC	Please refer to section B.5.3.1	<del>CAR-14</del> , OK

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
	estimates properly addressed?	/07/			
B.5.3.3	Leakage estimated	/01/ /02/ /07/	DR/ CC	Leakage emissions are estimated ex-ante as zero. However, please refer to section B.5.3.1 above.	<del>CAR 14</del> , OK
<b>B.5.4 Emission reductions</b>					
B.5.4.1	Has the methodology been correctly applied to calculate the emission reductions and can this be replicated by the data provided in the PDD and supporting files to be submitted for registration?	/01/ /02/ /07/	DR/ CC	The methodology is applied correctly to calculate the emission reductions in the PDD. However, PP is requested to refer section B.5.1.1, B.5.2.1 and B.5.3.1 above.	<del>CAR 12,</del> <del>CAR 13,</del> <del>CAR 14</del> , OK
B.5.4.2	Are all the assumptions and data used by the project participants listed in the PDD including their references and sources?	/01/ /02/	DR/ CC	Please refer to section B.5.4.1 above	<del>CAR 12,</del> <del>CAR 13,</del> <del>CAR 14</del> , OK
B.5.4.3	Is all the documentation used by the project participants as the basis for assumptions and source of data quoted and interpreted in the PDD?	/01/ /02/	DR/ CC	Please refer to section B.5.4.1 above	<del>CAR 12,</del> <del>CAR 13,</del> <del>CAR 14</del> , OK
B.5.4.4	Emission Reductions estimated	/01/02/	DR/ CC	Emission reductions estimated ex-ante is 171,085tCO <sub>2</sub> /year. However, please refer to section B.5.4.1 above.	<del>CAR 12,</del> <del>CAR 13,</del> <del>CAR 14</del> , OK
<b>B.6 Monitoring plan</b>					
<b>B.6.1 Parameters ex-ante</b>					
B.6.1.1	Does the monitoring plan contain the list of all parameters required by the approved methodology and by the applicable methodological tool?	/01/07/	DR/ CC	Yes; the monitoring plan in the PDD contains parameters required by the approved methodology and the applicable methodological tool. This is further discussed in below sections.	OK
B.6.1.2	How were the parameters available at validation verified?	/01/ /07/ /34/ /37/ /38/	DR/ CC	The following parameters were available at the time of validation: 1. COD <sub>out,x</sub> (COD of the effluent in period x): The project activity is a green-field project and hence in line with the methodology 120 mg/l design parameter has been considered. However, PP is requested to provide the exact source reference in PDD and ER worksheet.  2. COD <sub>in,x</sub> (COD directed to the open lagoon): The project activity is a green-field project and hence in line with the methodology 42,000 mg/l design	<del>CAR 15</del> , OK

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				<p>parameter has been considered. However, PP is requested to provide the exact source reference in PDD and ER worksheet.</p> <p>3. <math>\rho</math> (Discount factor for historical information) has not been included.</p> <p>4. <math>B_0</math> (Maximum methane producing capacity, expressing the maximum amount of <math>CH_4</math> that can be produced from a given quantity of COD): 2006 IPCC Guidelines default value of <math>0.21 \text{ kgCH}_4/\text{tCOD}</math> has been applied in line with the methodology.</p> <p>5. <math>D</math> (Average depth of the lagoon): The project activity is a green field project activity and hence it has to be identified as per the baseline lagoon design as identified in step 1 of the section "Procedure for the identification of the most plausible baseline scenario Identification of alternative scenarios"; However the source of data and the choice of data or measurement methods and procedures are not transparently outlines in the PDD. Also in section B.2 of the PDD, it is stated that depth of lagoon is 7 meter whereas as in other sections of the PDD it is mentioned as 6 meter. Kindly clarify.</p> <p>6. <math>EF_{N_2O,LA,sludge}</math> (<math>N_2O</math> emission factor for nitrogen from sludge applied to land): <math>0.016 \text{ kg N}_2\text{O}/\text{kg N}</math> default value as per applied methodology ACM0014, version 05.0.0.</p> <p>7. <math>MCF_{sludge,LA}</math> (Methane conversion factor for the application of sludge to lands): 0.05 default value as per applied methodology ACM0014, version 05.0.0.</p> <p>8. <math>GWP_{CH_4}</math> (Global warming potential for <math>CH_4</math>): 21</p>	

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				<p>default value as per IPCC 2006 guidelines.</p> <p>9. <math>GWP_{N_2O}</math> (Global warming potential for <math>N_2O</math>): 296 default value as per IPCC 2006 guidelines.</p> <p>10. PP is requested to clarify where <math>f_{CH_4, default}</math> (Default value for the fraction of methane in the biogas) is applied in the project activity.</p> <p>11. PP is requested to clarify where <math>\rho_{CH_4}</math> (Default value for density of <math>CH_4</math> at normal conditions) is applied in the project activity.</p> <p>12. <math>EF_{CH_4, default}</math> (Default emission factor for the fraction of <math>CH_4</math> produced that leaks from the anaerobic digester): It is not transparent in the PDD which value is used and the choice of data.</p> <p>13. <math>f_d</math> (Factor expressing the influence of the depth of the lagoon on methane generation): Default value as per the methodology. However, the depth is required to be justified for this.</p> <p>14. Ideal gas constant (<math>R</math>), <math>T_1</math> and Activation energy constant (<math>E</math>) are not included in section B.6.2 of the PDD.</p> <p>15. <math>EF_{grid, y}</math> (Combined margin grid emission factor): 0.5113 tCO<sub>2</sub>/MWh is applied. However, the exact source and choice of data is not discussed in the PDD.</p> <p>16. <math>TDL_{j, y}</math> (Average technical transmission and distribution losses for providing electricity to source <math>j</math> in year <math>y</math>): 20% default as per the 'tool to calculate baseline, project and/or leakage emissions from electricity consumption.</p>	

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				<p>17. <math>R_u</math> (Universal ideal gases constant): Default value 8,314 Pa.m<sup>3</sup>/kmol.K as per the 'tool to determine the mass flow of a greenhouse gas in a gaseous stream'.</p> <p>18. <math>MM_{k/i}</math> (Molecular mass of gas <math>k</math> or <math>i</math>): Kindly specify the gas referred in the project activity.</p> <p>19. <math>P_n</math> (Total pressure at normal conditions): 101,325 Pa default value as per the 'tool to determine the mass flow of a greenhouse gas in a gaseous stream'.</p> <p>20. <math>T_n</math> (Temperature at normal conditions): 273.15 K as per the 'tool to determine the mass flow of a greenhouse gas in a gaseous stream'.</p>	
B.6.1.3	Which default data have been selected and applied?	/01/ /07/	DR/ CC	Please refer to section B.6.1.2 above.	<del>CAR-15</del> , OK
B.6.1.4	Are all the values used in the PDD considered reasonable in the context of the proposed project activity?	/01/ /07/	DR/ CC	Please refer to section B.6.1.2 above.	<del>CAR-15</del> , OK
<b>B.6.2 Parameters ex-post</b>					
B.6.2.1	Does the monitoring plan described in the PDD comply with the requirements of the methodology and the applicable methodological tool?	/01/ /07/	DR/ CC	Yes; the monitoring plan described in the PDD is in line with the methodology. This has been further discussed in below sections.	OK
B.6.2.2	Does the monitoring plan contain all necessary parameters and are they clearly described?	/01/ /07/	DR/ CC	<p>The following parameters are to be monitored as per the PDD:</p> <p><math>F_{PJ,dig,m}</math> (Quantity of wastewater that is treated in the anaerobic digester or under clearly aerobic conditions in the project activity in month <math>m</math>): Continuous monitoring in a flow meter and recorded hourly or annually. Flow meter will be calibrated at least once in three years. However, QA/QC procedures are not specified in the PDD.</p> <p><math>COD_{dig,m}</math> (Chemical oxygen demand in the wastewater that is treated in the anaerobic digester in the project activity in</p>	<del>CAR-16</del> , OK

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				<p>month <math>m</math>): Weekly laboratory analysis with monthly and annual aggregate. Sample analysis shall be cross checked with third party certified laboratory analysis report.</p> <p><b>COD<sub>eff,dig,m</sub></b> (Chemical oxygen demand in the effluent from the anaerobic digester in the project activity in month <math>m</math>): Weekly laboratory analysis with monthly and annual aggregate. Sample analysis shall be cross checked with third party certified laboratory analysis report.</p> <p>PP is requested to clarify how the monitoring of <b>COD<sub>eff,lag,m</sub></b> (Chemical oxygen demand in the effluent from the open lagoon or dewatering facility) is relevant in the project activity.</p> <p><b>F<sub>PJ,eff,dig,m</sub></b> (Quantity of effluent from the anaerobic digester in month <math>m</math>): Continuous monitoring with a flow meter and daily recording. The flow meter shall be calibrated at least once in three years.</p> <p><b>F<sub>PJ,eff,lag,m</sub></b> (Quantity of effluent from the secondary treatment in which the effluent from the digester is treated in month <math>m</math>): Continuous monitoring with a flow meter and daily recording. The flow meter shall be calibrated at least once in three years.</p> <p><b>F<sub>biogas,y</sub></b> (Amount of biogas collected at the outlet of the digester tanks): Continuous monitoring and hourly recording. Flow meter shall be installed for monitoring measurement and shall be calibrated at least once in three years.</p> <p><b>F<sub>biogas,Kiln,y</sub></b> (Biogas flow to boiler): Continuous monitoring and hourly recording. Flow meter shall be installed for monitoring measurement and shall be calibrated at least once in three years.</p> <p><b>T<sub>2,m</sub></b> (Average temperature at the project site in month <math>m</math>): National or regional weather statistics shall be followed. Monthly update by national or regional statistics shall be recorded.</p> <p><b>W<sub>CH4,biogas,y</sub></b> (Concentration of methane in the total biogas supply in the outlet of the new digester): continuous</p>	

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				<p>measurement with a gas analyzer with accuracy <math>\leq \pm 1\%</math>. The gas analyzer shall be calibrated at least once in three years.</p> <p>PP is requested to clarify which parameter '<math>FV_{RG,h}</math>' is referring in the PDD and how it is in line with the tool.</p> <p><math>v_{i,t,db}</math> (Volumetric fraction of methane in the residual gas in the hour <math>h</math>): Continuous monitoring with a gas analyzer. However, the QA/QC procedures are not in line with the methodology.</p> <p>Other flare operating parameters (Flame detector): Continuous monitoring with a sensor. The sensor shall be calibrated at least half yearly.</p> <p><math>EC_{PJ,y}</math> (Amount of electricity consumed at the project site in a year): Continuous monitoring in a electronic meter. Calibration frequency and QA/QC procedures are not specified in the PDD. However, the notation and the description are not in line with the methodology.</p> <p><math>S_{LA,y}</math> (Quantity of sludge applied to land in year <math>y</math>): The amount of sludge removed from the system shall be measured in a weighbridge. The weighbridge shall be calibrated as per manufacturer recommendation. However, the recording frequency is not included in the PDD.</p> <p><math>Flame_m</math> (Flame on or flame off): Flame detection of flare in the minute <math>m</math> shall be measured with a fixed installation optical flame detector. Ultra violet detector or infra red or both. Detection of flame recorded as a minute that the flame was on, otherwise recorded as a minute that the flame was off. Equipment shall be maintained and calibrated in accordance with manufacturer's recommendations.</p> <p>Maintenance<sub>y</sub> (Maintenance events completed in year <math>y</math>): Record the date that maintenance events were completed in year <math>y</math>. Records of maintenance logs must include all aspects of the maintenance including the details of the person(s) undertaking the work, parts replaced, or needing to be replaced, source of replacement parts, serial numbers</p>	

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				and calibration certificates.	
B.6.2.3	Is the measurement equipment described? Is the accuracy of the measurement equipment addressed and deemed appropriate? Are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate?	/01/07/	DR/ CC	Please refer to section B.6.2.2 above.	<b>CAR-16, OK</b>
B.6.2.4	Is the monitoring and recording frequency adequate for all monitoring parameters? Is it in line with the monitoring methodology?	/01/07/	DR/ CC	Please refer to section B.6.2.2 above.	<b>CAR-16, OK</b>
B.6.2.5	How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design? Please confirm the ability of the project participants to implement the described monitoring plant.	/01/07/	DR// CC	The project proponent has formed an operation and management structure for monitoring and measurement of required parameters. The CDM project manager will be responsible for integrating the Monitoring Plan into Double A Ethanol Company Limited operation and maintenance procedures.	<b>OK</b>
<b>B.6.3 Management/Quality Assurance/Quality Control</b>					
B.6.3.1	Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)?	/01/	DR	Day to day record handling ((including what records to keep, storage area of records and how to process performance documentation) procedures are not included in the PDD.	<b>CAR-17, OK</b>
B.6.3.2	Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/01/07/	DR// CC	It is likely data management and QA/QC procedures are sufficiently in place. However, please refer section B.6.2.2 above.	<b>CAR-16, OK</b>
B.6.3.3	Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/01/07/	DR/ CC	Yes; all the data recorded under the monitoring plan will be kept till 2 year after the end of crediting period. This is in line with the methodology.	<b>OK</b>
<b>C.1 Crediting period</b>					
C.1.1	What is the expected crediting starting date of the proposed project activity? Does the crediting period start eight week after the request for registration?	/01/	DR	As per the section C.2.2 of the PDD, the expected starting date of crediting period is 01/12/2012 or date of registration of the project activity with UNFCCC whichever is later. However the date is not realistic considering the length of validation of the project activity. Therefore, PP is requested to consider a realistic start date for the first crediting period.	<b>CAR-18, OK</b>
C.1.2	What is the length of the crediting period? Is it clearly	/01/	DR	The PP has considered fixed crediting period of 10 years	<b>OK</b>

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
	defined and reasonable?			which is reasonable and appropriate.	
<b>D.1 Environmental impacts</b>					
D.1.1	Has an analysis of the environment impacts of the project activity been undertaken? Is it clearly and sufficiently described in the PDD?	/01/	DR/ CC	PP is requested to provide the environmental regulation applicable for the type of project activity in the host country and copy of environment clearance.	<del>CAR-19</del> , OK
D.1.2	Is the analysis of the environmental impacts required by the legislation of the host Country? If yes, has the EIA has been approved by local Government? Does the approval contain any conditions that need monitoring?	/01/	DR/ CC	Please refer to section D.1.1 above.	<del>CAR-19</del> , OK
D.1.3	Is it the project in line with the current environmental legislation in the host Country?	/01/	DR/ CC	Please refer to section D.1.1 above.	<del>CAR-19</del> , OK
D.1.4	Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/01/	DR/ CC	Please refer to section D.1.1 above.	<del>CAR-19</del> , OK
D.1.5	Are the sustainable development indicators in line with stated national priorities in the host country?	/01/	DR/ CC	PP is requested to provide the host LoA for the project activity.	<del>CAR-1</del> , OK
<b>E.1 Local stakeholder consultation</b>					
E.1.1	Are the local stakeholders be invited by the PP prior to the publication of the PDD to the UNFCCC website?	/01/	DR/ CC	The publication of PDD to the UNFCCC website for global stakeholder consultation was from 18/08/2012 to 08/09/2012. Local Stakeholder Consultation was conducted on 23/05/2008, prior to the publication of PDD for webhosting. The validation team interviewed some of the local stakeholders during the site visit and found that the stakeholder meeting was organized by the PP and they participated in the meeting. Further, advertisement for the stakeholder meeting was also published in local newspaper "Siang Mahachon". However, date of invitation to stakeholders and stakeholder categories are not mentioned in the PDD.	<del>CAR-20</del> , OK
E.1.2	Area the stakeholders invited be considered as regards commenting the proposed project activity?	/01/27/	DR// CC	From the list of attendees and copy of invitation letters it is evident that the stakeholders who attended the meeting were from local village and are relevant to the project activity. However, please refer to section E.1.1 above.	<del>CAR-20</del> , OK
E.1.3	Is the summary of the comments received from the stakeholders, provided in the PDD complete?	/01/27/	DR/ CC	The summary of comments received during the stakeholder meeting is presented in section E.2 of the PDD. It is also evident from the minutes of the stakeholder meeting and	OK

Checklist Question		Reference	MoV <sup>1</sup>	Comments	Conclusion
				confirmed that no adverse comments were received. Further, during the site visit by the validation team while interviewing local stakeholders no negative comment was noted.	
E.1.4	Has due account been taken by the project participants of any stakeholder comments received?	/01/27/	DR/ CC	Please refer to section E.1.3	<b>OK</b>
E.1.5	If a stakeholder consultation process is required by regulations/laws in the host Country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/01/34/	DR/ CC	Please refer to section D.1.1 above.	<b>CAR 19, OK</b>

**TABLE 3 RESOLUTION OF CORRECTIVE ACTION REQUESTS AND CLARIFICATION REQUESTS**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
<b>CAR 1:</b> PP is requested to submit the Letter of Approval from host country DNA and Annex-I party.	A.1.1, A.3.3, A.3.4, A.3.5, A.3.6, A.3.7, D.1.5	<p>The Letter of Approval from the host country is now submitted to the DOE.</p> <p>The Annex – I party is now removed as project participant from the project activity. Therefore, LoA of Annex – I party is not applied.</p> <p><b>2<sup>nd</sup> Response:</b></p> <p>The Letter of Approval from the Annex-I party is now provided to the DOE.</p> <p>The Annex-1 party continues to be the project participant for the project activity</p>	<p>The letter of approval from host (Thailand) DNA dated 18/10/2012 is submitted by PP. The letter of approval prescribes the precise project activity. Further, the Annex-I party Climate Change Capital Limited from United Kingdom is removed from the project activity. PP is requested to provide the voluntary withdrawal letter from the same entity. Further, the validation agreement was executed between Climate Change Capital Limited and the DOE. Kindly clarify the entity who will have contractual arrangement with the DOE for further validation of the project activity with documentary evidence. <b>CAR is open.</b></p> <p><b>2<sup>nd</sup> Review:</b></p> <p>Letter of approval from Annex-I party (United Kingdom) dated 26/11/2012 has</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
			been submitted authorizing Climate Change Capital Limited (CCC) as one of the project participant in the project 'Double A Ethanol wastewater treatment plant'. Further, revised PDD again included CCC as one of the project participant. Hence, response is accepted and <b>CAR is closed</b> .
<p><b>CAR 2:</b></p> <p>The PDD is not transparent on the following as per the latest "Guidelines for completing the project design document form", version 01.0, Annex 8 of EB 66 dated 02/03/2012.</p> <ol style="list-style-type: none"> <li>1. It is not mentioned in the PDD that PP (M/s Double A Ethanol Company Limited) is a public entity which is not correct as per the document review and site visit report.</li> <li>2. The project implementation details are not included in section A.1 of the PDD.</li> <li>3. The sections of the PDD are not correct with the "Project Design Document Form for CDM Project Activities (F-CDM-PDD)" version 04.1.</li> <li>4. The PDD is not consistent on the baseline fossil fuel.</li> <li>5. Post code number of Climate Change Capital Limited in Appendix-1 of the PDD</li> </ol>	A.1.2, A.1.3, A.2.3	<ol style="list-style-type: none"> <li>1. It is now corrected in the PDD that PP (M/s Double A Ethanol Company Limited) is a private entity which as per the documents review and site visit report.</li> <li>2. The project implementation details are now included in the section A.1 of the PDD on page 2.</li> <li>3. The sections of the PDD are corrected as per the "Project Design Document Form for CDM Project Activities (F-CDM-PDD)" version 04.1.</li> <li>4. The PDD is now consistent on the baseline fuel oil i.e. Fuel oil (Bunker C)</li> <li>5. The post code number of Climate Change Capitol Ltd. is not required as it is now being removed from the project activity as PP.</li> </ol>	<ol style="list-style-type: none"> <li>1. Project Participant Double A Ethanol Company Limited is a private entity which has been corrected in the revised PDD. <b>Query is closed.</b></li> <li>2. The project implementation details are included in section A.1 of the revised PDD. <b>Query is closed.</b></li> <li>3. The sections of the revised PDD is in line with the "Project Design Document Form for CDM Project Activities (F-CDM-PDD)" version 04.1. Hence, response is accepted and <b>query is closed</b>.</li> <li>4. The baseline fuel is Bunker C which is made consistent throughout the revised PDD. Response is accepted and <b>query is closed</b>.</li> <li>5. Contact information of project participant Double A Ethanol Company Limited is presented in Appendix 1 of the PDD. Since, Climate Change Capital Ltd. is removed as project participant in the revised PDD, the contact information of the same entity is not required. Hence, response is accepted and <b>query is closed</b>.</li> </ol> <p>In summary, <b>CAR is closed</b>.</p>
<p><b>CAR 3:</b></p> <p>PP is requested to submit the latest version of the</p>	A.4.1, A.4.2, A.4.3, A.4.4, A.4.5	The latest version of the Modalities of Communication statement (F-CDM-MOC)	MoC along with documentary evidence of personal identity and corporate identity of

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
Modalities of Communication statement (F-CDM-MOC) and documentary evidence to check the authenticity of the signing authority.		is now submitted to the DOE. <b>2<sup>nd</sup> Response:</b> The latest version of the Modalities of Communication statement (F-CDM-MOC) is submitted to the DOE.	the focal point person has not been submitted. <b>CAR is open.</b> <b>2<sup>nd</sup> Review:</b> Documentary evidence for corporate and personal identify with signature has been provided against the signatories in the MoC. Hence, response is accepted and <b>CAR is closed.</b>
<b>CAR 4:</b> The GPS coordinates presented in the PDD are not correct when checked with GPS device during the site visit. PP is requested to provide the correct GPS coordinates in degree, minutes and seconds	A.5.1	The GPS coordinates are corrected as per the actual reading recorded during the site visit which is included in the PDD on page 3.	The geographical coordinates of the project location has been corrected in the revised PDD. The same is found to be consistent with the GPS coordinates checked during the site visit. Hence, response is accepted and <b>CAR is closed</b>
<b>CAR 5:</b> Section A.3 should include the age and average lifetime of the equipment based on manufacturer's specifications as per the PDD guideline. Also the flare specifications are mission in the section	A.5.3	The average lifetime of the equipment and flare specifications are provided in the PDD on page 6 & 8 respectively. <b>2<sup>nd</sup> Response:</b> The technology supplier for the project activity is Siemens, Thailand and it is now rectified and mentioned in the PDD on page 6.	PP has included average technical life of project equipments as 15 years which is as per similar projects in the region. However, PP is requested to clarify why technical life as per technology supplier is not referred when the technology supplier is engaged for the project activity. <b>CAR is open.</b> <b>2<sup>nd</sup> Review:</b> The certificate from the equipment manufacturer (IC reactor) has been provided which justify the equipment life as 15 years. Hence, <b>CAR is closed.</b>
<b>CAR 6:</b> The project activity and baseline scenario are not described in the PDD transparently for scenario 1 and scenario 2 of the methodology applicability condition. PP is requested to clarify what stands for EQ in the flow diagram in figure B2.1 of the PDD and also requested to provide the basis on which the	B.1.3	The description has been included transparently for the project activity for scenario 1 and scenario 2 of the methodology applicability condition. Please refer to the table B.2.1 of the PDD.  EQ stands for "Equalization tank" in the flow diagram in figure B2.1 of the PDD.	The revised PDD describes transparently the project activity in relation to baseline scenario 1 and 2 of the methodology.  The flow diagram in absence of the project activity is as per the baseline study report prepared by Namsai 304

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
<p>flow diagram of the wastewater treatment plant in the absence of the project activity has been outlined.</p> <p>PP is requested to provide the basis based on which it is stated that the depth of the anaerobic open lagoons in the absence of the project activity would be 7 m.</p> <p>PP is requested to provide the basis based on which it is stated that the residence time of organic waste in baseline scenario is 70 days.</p> <p>PP is requested to provide supporting evidence based on which it is stated that no solid material shall be treated in the project activity.</p> <p>PP is requested to provide supporting evidence based on which it is stated that sludge produced onsite during the implementation of the project activity will be immediately disposed for land application and shall not be stored at any point of time in the project activity since as per section A.3 of the PDD sludge will be transferred to a storage area.</p>		<p>The flow diagram of the wastewater treatment plant in the absence of the project activity has been outlined on the basis of design specifications provided by independent authority in their report on baseline study for the wastewater treatment plant.</p> <p>As per the baseline report (Report for Anaerobic lagoon) the depth considered for lagoon is 6 m and not 7m which is now corrected in the PDD and similarly residence time of organic waste in baseline scenario is also rectified from 70 days to 30 days as per the baseline report.</p> <p>A baseline study has been carried out by an independent authority "Namsai 304 Company Ltd.". As recommended by the experts in the assessment report (Report for Anaerobic Lagoon) the depth of anaerobic lagoon of 6m and HRT of 30 days is considered ideal for the treatment of the wastewater to be generated from the project. An aggregated HRT of 70 days was estimated reporting the PDD, however it is now corrected as per the baseline assessment report. Thus, PDD has now has been revised with correct depth of 6 m and HRT of 30 days, as prescribed in the baseline assessment report.</p> <p>As per the technology provider (i.e. as described in the Proposal from Siemens_2007) there is no solid material treated in the project activity. Also the final work order does not include any</p>	<p>Company Limited dated 26/09/2007. The report is prepared by third party and hence accepted by the validation team.</p> <p>As per the baseline study report by Namsai 304 Company Limited dated 26/09/2007, the depth of anaerobic lagoon is suggested to be 6 meter with residence time of 30 days. The revised PDD is corrected accordingly and hence response is accepted.</p> <p>As per the technical proposal and final work order signed with the technology supplier, there is no solid material treatment system in the project activity. Hence, response is accepted and query is closed.</p> <p>It is stated in the PDD that sludge will be transported to a storage area from where it will be transferred for land application. However, the storage is only for collection and does not stored for a long time period. However, it is not transparent how it can be ensured that it will not be stored for a long period. Hence, <b>CAR is open.</b></p> <p><b>2<sup>nd</sup> Review:</b></p> <p>Since the project activity is yet to be commissioned, the sludge generation and its transportation for land application procedure could not be checked during the site visit. From the description of its management it can be assumed that</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>treatment system for solid material. Hence, it can be confirmed that there is no treatment of solid materials in the project activity.</p> <p>As per the statement in the PDD in section A.3 the sludge will be stored only to facilitate collection of considerable amount of sludge for transportation to farmers or collectors to be used as fertilizer or will be applied to land. This storage facility is, therefore not permanent and will not produce any anaerobic conditions. The storage area of the sludge is meant for quantification of generated sludge in the project activity and its distribution for end use.</p> <hr/> <p><b>2<sup>nd</sup> Response:</b></p> <p>The PP ensures that the sludge will be stored for maximum 2 days at the sludge storage facility. The PP will be maintaining records of quantity of sludge generated on daily basis in their log books during the operation of the project activity plant.</p> <p>During the crediting period the quantity of sludge provided to the farmers can be verified through receipts of sale of amount of sludge and the quantity of sludge sent for land application can be verified through the gate pass issued for vehicle used for transportation of the sludge for land application. Thus, it can be verified from the records of sludge produced and sold or sent for land application that the sludge is not stored for longer periods at</p>	<p>there will not be any anaerobic degradation leading to methane emissions. However, this will be cross checked during first verification in compliance with the latest applicable tool 'project and leakage emissions from anaerobic digester'. <b>FAR 1 is raised.</b></p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>the project site.</p> <p>Further, the project system efficiently removes of 90% of total organic matter in the anaerobic digester and therefore the sludge generating rates are lower. Hence, it is evident that storage of small quantity of sludge for 2 days will not lead to any fugitives emissions.</p>	
<p><b>CAR 7:</b></p> <p>The description of the project boundary is not transparent in the PDD. PP is requested to clarify why the site where any sludge/dewatered wastewater applied and heat generating equipments are not included in the project boundary. The grid electricity consumption (project emissions) is not reflecting in the project boundary diagram. Also table B.3.1 shows that electricity is not included in the baseline scenario, whereas table B4.1 shows that electricity is being consumed in the baseline scenario. Further, the monitoring points are not highlighted in the flow diagram of the project boundary.</p> <p>It is also noted that the biogas replaces the bunker oil only partially in the boiler and thus the emissions from the bunker oil consumption are not transparent in the project boundary.</p>	B.2.1, B.2.2, B.2.3	<p>The project boundary is now described transparently in the PDD. The site where sludge/dewatered wastewater is applied is now included under the project boundary. However, the heat generating equipments are not included in the project activity as no emission reductions are claimed for FO displacement due to biogas. Further, the heat generating equipments are not part of the Ethanol facility but the part of adjacent lime kiln.</p> <p>As per the methodology Table 1 the biogas extracted from the anaerobic digester should be either flared or utilized. Therefore, the biogas generated by the project activity is not utilized at site but at the adjacent facility and hence not included in the project boundary but the end use of utilization of the biogas is transparently described in the PDD. Also, if during exigencies the biogas will be flared the project emissions due to flaring will be accounted for that period. The flaring equipments are the part of the project boundary. This is a conservative approach.</p> <p>The grid electricity emissions are now included in the project boundary diagram. The emission reduction calculation has</p>	<p>Project boundary is revised in the PDD as per the methodology. Response is accepted and <b>CAR is closed</b>.</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>already accounted this in the project emission calculation.</p> <p>The fossil fuel is not utilized in the project activity and the biogas generated from the project activity will replace the fuel oil that is used by other facility. However, the emission reductions are not claimed for replacement of fuel oil (Bunker C) in the project activity, hence not included in the project boundary as well. This is also a conservative approach for emission reduction. As per the applied methodology the biogas generated shall either be utilized or flared; the biogas will be utilized by an existing lime kiln facility adjacent to the ethanol plant premises and the biogas will be flared only during exigencies at the project site. The replacement of fuel oil is a result of biogas availability, which is dependent on its production from the wastewater treatment plant.</p> <p>As per the applied methodology AM0014 (v05.0.0) the electricity consumed in the baseline can be excluded for simplification. The same is rectified in the PDD.</p> <p>Also the monitoring points are now included in the flow diagram of the project boundary and tabulated separately.</p>	
<p><b>CAR 8:</b> PP is requested to explain the following:</p> <p>1. The PDD does not have the detailed input</p>	B.4.4.5, B.4.4.6, B.4.4.9, B.4.4.10	<p>1. All the input values are provided with source in the PDD.</p> <p>2. The waste water production and the</p>	<p>1. Source of input values considered for investment analysis has been included in the revised PDD. <b>Query is closed.</b></p> <p>2. The question was raised in the NPV</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
<p>values with source.</p> <p>2. Please explain the reason for considering ethanol production days taken 5000 and 330 days per year separately and the calculation of operation and maintenance cost for open lagoon system.</p> <p>3. PDD is referring the wrong paragraph of the investment analysis guideline in section B.5 of the PDD</p>		<p>operating days are considered from the baseline reports. The total annual O&amp;M cost estimated in the report was based on per cubic meter of wastewater and also dependent on annual operational days. As per the baseline report the total wastewater generated in a year is 5000 m<sup>3</sup> and operating days are 330 days. Furthermore, the cost of Raw material, cost of management and maintenance and repair cost are estimated separately based on per cubic meter of wastewater in the baseline report. Therefore, the annual operation and maintenance cost for the open lagoon system is the sum of all the above costs required to treat 1m<sup>3</sup> of wastewater, which is estimated to be 8 Baht/m<sup>3</sup>. Thus, the total O&amp;M cost incurred in a year is further calculated as: 5000m<sup>3</sup>/day * 330 days/yr * 8 baht/m<sup>3</sup>. The same calculation method has been adopted in the NPV sheet.</p> <p>The Report for Anaerobic Lagoon has also been submitted to the DOE as the source of reference.</p> <p>3. The references to the paragraphs of the investment analysis guideline in the section B.5 of the PDD are now corrected.</p> <p><b>2<sup>nd</sup> Response:</b></p> <p>2. The values in row 8 and 9 are different parameters with different values and the same is now rectified in the NPV analysis sheet W1 assumptions.</p>	<p>calculation worksheet, W1 assumptions, where row 8 and row 9 are same parameters with different values. Kindly rectify the same. <b>Query is open.</b></p> <p>3. The revised PDD correctly refers the paragraph 19 of the investment analysis guideline which describes the correctness of considering investment analysis option for the project activity. Hence, <b>query is closed.</b></p> <p>PP is requested to respond to the open queries. <b>CAR is open.</b></p> <p><b>2<sup>nd</sup> Review:</b></p> <p>PP has corrected the NPV worksheet with description of parameters and its input values. Hence, response is accepted and <b>CAR is closed.</b></p>
<b>CAR 9:</b>	B.4.4.11, B.4.4.12	Since the project is currently under construction there are no actual/final	Since, the project is not yet commissioned; the actual values of input

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
<p>PP is requested to justify the sensitivity range of <math>\pm 10\%</math> with actual values of input parameters. Further, the PDD does not describe the required variations of key parameters to reach the benchmark and the possibility of happening the same. In addition, please explain the followings:</p> <ol style="list-style-type: none"> <li>1. For O &amp; M cost sensitivity, revenue has been affected with sensitivity, kindly rectify the same.</li> <li>2. For project cost sensitivity, depreciation, maintenance cost and interest is not affected.</li> </ol>		<p>values available for the input parameters for NPV analysis. Therefore sensitivity analysis has been conducted as per the Investment analysis guidance, (section VI para 20 and 21) i.e. min. range of <math>\pm 10\%</math> sensitivity has been carried out for the identified parameters (project cost, O&amp;M costs and revenue from FO savings) and is justifiable.</p> <p>However, sensitivity analysis for "project cost" and "revenue" has been evaluated based on actual available information. In this regard, a comparison analysis has been conducted for "Project cost" and "Revenue", where the actual costs incurred till date and revenue from FO savings are compared with assumed values (i.e. 'actual project cost' is considered as the agreed cost as provided in the Work orders and for 'revenue' current FO price is considered for comparison). As can be seen in the "Cost Comparison" sheet, the % variations of actual costs are well below the sensitivity range that meets the benchmark. Hence, <math>\pm 10\%</math> sensitivity is appropriate for the investment analysis.</p> <p>With regard to the break even conditions, a separate sheet has been included to show at which variations of the respective parameters (Project Cost, O&amp;M and Revenue) the NPV of the project activity (without CDM) reaches the NPV of baseline investment (without CDM). The analysis has also been included in the PDD.</p>	<p>parameters are not yet available. Hence, PP has considered <math>\pm 10\%</math> range of parameters which contribute 20% of either project cost or revenue. This is in line with the EB 62, Annex 5 and hence accepted by the validation team. However, it is not clear what benchmark is stated in the response. In addition,</p> <ol style="list-style-type: none"> <li>1. Decrease in O&amp;M by 10% still considers decrease in revenue by 10%, the same has not been rectified.</li> <li>2. The depreciation and interest are affected by the project cost sensitivity, but the maintenance cost is not affected by the project cost sensitivity.</li> <li>3. The calculation for the break even analysis has not been received.</li> </ol> <p>Hence, <b>CAR is open.</b></p> <hr/> <p><b>2<sup>nd</sup> Review:</b></p> <p>The necessary corrections have been done in the revised NPV worksheet and hence response is accepted and <b>CAR is closed.</b></p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>Further,</p> <p>1) The sheet has been rectified w.r.t the sensitivity in O&amp;M.</p> <p>2) The sensitivity parameter for project cost has been re-linked.</p> <hr/> <p><b>2<sup>nd</sup> Response:</b></p> <p>1. The sensitivity in O&amp;M cost can be checked from the excel-calculator provided in the "Summary and Assumption Sheet" (Please refer to the column F &amp; G).</p> <p>Any change in % in the Cell # G6 in the calculator will affect only the O&amp;M costs, i.e. Row 14 &amp; 15 in the "Base case" sheet, whereas the revenue (i.e. Row 12) remains unaffected.</p> <p>However, in the sheet "Sens O&amp;M Cost", the 2nd part (i.e. row 46 onwards) was previously shown for -10% variation in revenue as well as O&amp;M cost. Hence, the section has been corrected to address only decrease in O&amp;M cost and row 57 has been rectified.</p> <p>2. The O&amp;M cost is considered as variable cost, hence not included under the Capital investment cost which is fixed. Hence sensitivity in Project cost will not include the variation in O&amp;M cost. However as explained in the previous comment, the maintenance cost is already subjected to the sensitivity along with Operation and hence not left out in sensitivity analysis.</p>	

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		<p>With regard to the depreciation and interest in loan, they are dependent on the project cost as seen in the row 32 &amp; 43 in the "Base case" sheet. Hence any variation in project cost would automatically affect the two parameters.</p> <p>3. The calculation for the break even analysis has been incorporated in the form of Sensitivity analysis, which can be checked from the table in the cell F10 in the "Summary and Assumption Sheet". The break even is considered as the situations of the sensitive parameters (i.e. the respective values of the parameter after applying sensitivity) at which the NPV of the Project activity reaches or marginally crosses the NPV of the baseline case (i.e. the investment in the Open lagoon system).</p> <p>However, the break even analysis table has been updated further to include the break-even values of respective parameters. Please refer to the column H in the "Summary and Assumption" sheet. Relevant section in the PDD has also been updated accordingly.</p>	
<p><b>CAR 10:</b></p> <p>The PDD is not transparent on the different technologies in the context of common practice as per the "tool for the demonstration and assessment of additionality".</p>	B.4.6.2	<p>The different technologies in context of common practice are now demonstrated in the PDD on page 24-25. The common practice analysis is now as per the tool for the demonstration and assessment of additionality".</p> <p><b>2<sup>nd</sup> Response:</b></p> <p>In the Step 1 of the common practice guideline the plants that are identified in the applicable output range of <math>\pm 50\%</math> are</p>	<p>PP is requested to clarify why ethanol plant capacity (500,000 liter/day) is considered in step 1 of common practice analysis to identify applicable output range of <math>\pm 50\%</math> when the project is actually to install a wastewater treatment plant in the ethanol plant. Please explain how it is in line with the guideline.</p> <p>Further, PDD is not transparent how <math>N_{diff}</math></p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		considered for further evaluation in Step 2. However, in Step 1 the applicable output range of wastewater for the enlisted plants do fall in the output range. Thus, $N_{all}$ is zero. Therefore, there are no plants identified for comparison in Step 2 to evaluate for $N_{diff}$ and hence this parameter ultimately becomes zero.	is zero with respect to 'different technologies' as included in para 9 of additionality tool. <b>CAR is open.</b>  2 <sup>nd</sup> Review: Since the project activity is implemented in an ethanol plant hence, all ethanol plants in the host country has been considered and accordingly stepwise approach of common practice has been carried out. Response is accepted and <b>CAR is closed.</b>
<b>CAR 11:</b> Please explain: <ol style="list-style-type: none"> <li>How the output range of 250 to 750 million liter of ethanol per year has been calculated. Ethanol production capacity of different plants listed in step 2 of the common practice mention 'liter/year' whereas the source document shows the unit in 'liter/day'.</li> <li>Please explain how <math>N_{all}</math> have been arrived at 2.</li> <li>Step 3 is not transparently described how <math>N_{diff}</math> has been arrived at 2. How the plants with different technologies have been identified</li> </ol>	B.4.6.4, B.4.6.5	<ol style="list-style-type: none"> <li>The output range is calculated as per the tool (+/- 50% of the design output capacity), based on ethanol production capacity of the plant on per day basis which is as per the source document. This has been rectified in the PDD.</li> <li>Since there are no plants that qualify within the output range calculated as per the guidelines on common practice (+/- 50% of the design output capacity) before the start date of the project activity and hence <math>N_{all}</math> has been arrived at 0. This is explicitly demonstrated in the PDD on page 26.</li> <li>Since in the Step 2 <math>N_{all} = 0</math>, there are no plants identified for further comparison as none of the ethanol plants are in the output range of capacity as per Step 1, which should be before the start date of the project activity. The maximum capacity of other similar plants is 200,000 liters/day and comparable plants shall fall within the range of 250,000 – 750,000</li> </ol>	PP is requested to clarify why ethanol plant capacity (500,000 liter/day) is considered in step 1 of common practice analysis to identify applicable output range of $\pm 50\%$ when the project is actually to install a wastewater treatment plant in the ethanol plant. Please explain how it is in line with the guideline. Accordingly other steps of common practice analysis have to be assessed. <b>CAR is open.</b>  2 <sup>nd</sup> Review: Since the project activity is implemented in an ethanol plant hence, all ethanol plants in the host country has been considered and accordingly stepwise approach of common practice has been carried out. Response is accepted and <b>CAR is closed</b>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		liters/day. Thus, $N_{all}$ and $N_{diff} = 0$ .  <b>2<sup>nd</sup> Response:</b> The common practice analysis has been revised to include the design capacity of the wastewater treatment plant which is the project activity and demonstrated on page 25-26 of the PDD. The wastewater capacity is considered in Step 1 to identify applicable output range of $\pm 50\%$ which in line with guideline	
<b>CAR 12:</b> PP is requested to explain the following: <ol style="list-style-type: none"> <li>1. The detailed ex-ante calculations of baseline emissions in line with the equations presented in section B.6.1 of the PDD are not presented in section B.6.3 of the PDD.</li> <li>2. Source of assumptions used in the ER calculation worksheet has not been provided. PP is requested to provide exact reference of all data assumptions.</li> <li>3. Calculation procedure of <math>Q_{CH_4, y}</math> is not included in the PDD.</li> <li>4. Please explain the choice of <math>f_d</math> value in section B.6.2 of the PDD.</li> <li>5. Kindly provide more details how the average temperature at the project site has been considered.</li> <li>6. In the calculation of <math>f_{T,m}</math>, please explain why the minimum temperature limit is kept as 283K when the methodology specify it as 278K. Further, PP is requested to maintain the values up-to decimals as per the methodology.</li> <li>7. Why discount factor for historical</li> </ol>	B.5.1.1, B.5.1.3 B.5.1.2,	<ol style="list-style-type: none"> <li>1. The detailed ex-ante calculations of baseline emissions in line with the equations presented in section B.6.1 of the PDD are now presented in section B.6.3 of the PDD on page 45</li> <li>2. All sources of assumptions and exact reference of all data used in the ER calculation worksheet is provided in the ER sheet. Revised ER sheet is being submitted.</li> <li>3. Calculation of <math>Q_{CH_4}</math> is included in the PDD in section B.6.1 (page 31) and B.6.3 (page 50)</li> <li>4. As per the applied methodology ACM0014 (v 05.0.0), <math>f_d</math> value is chosen depending on the depth of the lagoon in the baseline. Therefore, as per the report for anaerobic lagoon the depth of lagoon in the baseline would be 6m, Thus the corresponding value of <math>f_d</math> is applied for lagoon depth more than 5m.</li> </ol>	<ol style="list-style-type: none"> <li>1. The PDD is revised and ex-ante calculations of baseline emissions are presented transparently in section B.6.1 and section B.6.3. <b>Query is closed.</b></li> <li>2. Please explain when open lagoon is designed to operate 24 hours for 330 days in a year how 8,760 hrs/year has been considered in 'raw 31' (assumptions) of ER worksheet. In 'raw 45' (assumptions) of ER sheet why 75% is used to calculate the biogas generation. <b>Query is open.</b></li> <li>3. PDD is revised and calculation procedures of <math>Q_{CH_4, y}</math> has been included as per the methodology. <b>Query is closed.</b></li> <li>4. The explanation is not reflecting in the 'choice of data' section in the table under B.6.2. <b>Query is open.</b></li> <li>5. Thai Meteorological Department provides month wise average temperature data respective to its</li> </ol>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
information (p) is not included in the ER worksheet		<p>5. The average temperature at the project site is taken from the data Thai Meteorological Department - <a href="http://www.tmd.go.th/en/climate.php?FileID=3">http://www.tmd.go.th/en/climate.php?FileID=3</a></p> <p>6. The minimum temperature limit has been rectified as per the methodology and the values are maintained upto 3 decimal points as per the methodology.</p> <p>7. As per the methodology ACM0014 (v05.0.0) the discount factor for the Greenfield project activity is 1, this is now included in the ER worksheet.</p> <p><b>2<sup>nd</sup> Response:</b></p> <p>2. The operation hours per year as calculated depending on the operational hours per day is now corrected in the ER worksheet.</p> <p>75% is the concentration of the methane in the biogas as provided in the EPC contract page 7 and 69. This value is used for ex-ante calculations only. For ex-post calculations there will be direct measurements of methane concentration in the biogas by installed measuring equipment and monitored value will be used for calculation.</p> <p>The explanation is now included in the 'choice of data' section in the table under B.6.2. of the PDD.</p>	<p>regions. However, from the web-link and explanation in the PDD, it is not clear for which region the temperature data have been provided. Hence, <b>query is open</b>.</p> <p>6. The revised PDD is corrected as per the methodology. Hence, response is accepted and <b>query is closed</b>.</p> <p>7. The revised PDD is corrected as per the methodology. Hence, response is accepted and <b>query is closed</b>.</p> <p>PP is requested to respond to the open queries. <b>CAR is open</b>.</p> <p><b>2<sup>nd</sup> Review:</b></p> <p>The operation hours has been corrected in the revised ER worksheet.</p> <p>For ex-ante estimation, design concentration of methane in biogas has been considered to estimate methane quantity. Since, the biogas generation shall be monitored ex-post the response is accepted and query is closed.</p> <p>Similarly, temperature of the project site shall be monitored and hence, response is accepted and query is closed.</p> <p>In summary, <b>CAR is closed</b>.</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		5. The plant is located in the Pranchinburi province which is situated in the eastern part of the country. Therefore, the temperature data for eastern region will be used	
<p><b>CAR 13:</b> PP is requested to explain the followings.</p> <ol style="list-style-type: none"> <li>Please explain what does the statement “Error! Reference source not found” means in the calculation of project emissions under section B.6.1.</li> <li>Provide the exact source for grid combined margin emission factor considered for the project activity.</li> <li>Please note that flare efficiency in case of open flares in the minute <math>m</math> (<math>\eta_{\text{flare},m}</math>) is 50% when the flame is detected in the minute <math>m</math> (<math>f_{\text{flame},m}</math>), otherwise <math>\eta_{\text{flare},m}</math> is 50%. This is not transparent in the PDD.</li> <li>It is not transparent in the PDD what does ‘flaring tool’ refer to while determining the mass flow of the gaseous stream in page 31 of the PDD.</li> <li>Calculation formula of project emissions from flaring (page 33 of the PDD) is not in line with the tool “project emissions from flaring”</li> </ol>	B.5.2.1, B.5.2.2, B.5.2.3	<ol style="list-style-type: none"> <li>This statement was a typing mistake which is now rectified in the PDD.</li> <li>The exact source of grid combined margin emission factor is now provided in the PDD on page 32.</li> <li>The biogas will be sent to open flaring only in exigencies. Thus, as per the tool “Project and leakage emissions from the anaerobic digester” Step 5 project emissions will be considered when biogas is flared in the project activity. Further as per the tool “Project emissions from flaring” Step 2 for open flares as in the project activity, the flare efficiency of 50% will be applied when the flame is detected in a minute otherwise the flare efficiency will be 0%.</li> <li>The Flaring tool refers to tool for “Project emissions from flaring” and it now clarified in the footnote 33 in the PDD.</li> <li>The project emissions from flaring is rectified in the PDD and they are now in line with the tool “project emissions from flaring”</li> </ol> <p><b>2<sup>nd</sup> Response:</b></p>	<ol style="list-style-type: none"> <li>PDD is corrected and hence <b>query is closed</b>.</li> <li>Source of grid combined margin emission factor has been included in the PDD. However, the exact steps in line with the ‘tool to calculate the emission factor for an electricity system’ have been presented neither in the PDD nor in the ER worksheet. <b>Query is open</b>.</li> <li>Flare efficiency in case of open flare has been corrected in the revised PDD in line with the tool ‘project emissions from flaring’. Hence, response is accepted and <b>query is closed</b>.</li> <li>Footnote 33 in the PDD does not refer the said tool. Kindly correct the PDD and provide appropriate answer. <b>Query is open</b>.</li> <li>Calculation formula of project emissions in line with the tool ‘project emissions from flaring’ is corrected in the revised PDD. Hence, response is accepted and <b>query is closed</b>.</li> </ol> <p>PP is requested to respond to open queries. <b>CAR is open</b>.</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>2. The exact steps in line with the 'tool to calculate the emission factor for an electricity system' have now been provided in the ER calculation sheet.</p> <p>4. It is now corrected in the PDD and the footnote 37 refers to the said tool</p>	<p><b>2<sup>nd</sup> Review:</b></p> <p>Stepwise approach of combined margin calculation has been presented in the revised ER worksheet. The same is found to be consistent with publicly available source (host country DNA). Further, correction in reference has been done in the revised PDD.</p> <p><b>CAR is closed.</b></p>
<p><b>CAR 14:</b></p> <p>As per the methodology, leakage emissions have to be estimated as per the tool "project and leakage emissions from anaerobic digesters". However, PP is requested to explain how the leakage emissions are estimated as zero in line with the methodology.</p>	<p>B.5.3.1, B.5.3.3</p> <p>B.5.3.2,</p>	<p>The leakage emissions as per the methodology shall be calculated as per the tool "project and leakage emissions from anaerobic digesters". Thus, as per the tool para III, leakage emissions are calculated depending on how the digestate is managed. Leakage emissions are accounted only when the digestate from the anaerobic digester is either stored under anaerobic conditions or composted. However, in the project activity the sludge or the digestate from the digester will be directly applied to land or provided to the farmers and will not be stored under anaerobic conditions at any point of time. Thus, leakage emissions shall not be accounted and will be zero inline with the tool and the methodology.</p> <p><b>2<sup>nd</sup> Response:</b></p> <p>The explanation is now included in the PDD on page 36.</p> <p>The project is not yet commissioned however during the operation of the project plant the PP shall maintain a log book to record the quantity of sludge generated on daily basis and the quantity of sludge sold or sent for land application.</p>	<p>The explanation is not presented in the PDD. Further, PP is requested to clarify how it can be ensured that sludge will not be stored anaerobically leading to leakage emissions. <b>CAR is open.</b></p> <p><b>2<sup>nd</sup> Review:</b></p> <p>Since the project activity is yet to be commissioned, the sludge generation and its transportation for land application procedure could not be checked during the site visit. From the description of its management it can be assumed that there will not be any anaerobic degradation leading to methane emissions. However, this will be cross checked during first verification in compliance with the latest applicable tool 'project and leakage emissions from anaerobic digester'. <b>FAR 1 is raised.</b></p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>The PP has ensured that sludge generated on daily basis will be stored maximum for 2 days at the project activity site.</p> <p>The quantity of sludge sold to the farmers can be verified through the receipts issued for sale of the sludge and the quantity of sludge sent for land application can be verified from the gate pass issued for vehicles used for transportation of the sludge for land application.</p> <p>Further it should be noted that the project activity systems have 90% efficiency to remove the organic matter from the wastewater hence the sludge generation rates are quite low on daily basis. Hence the storage of sludge for 2 days would not lead to any fugitive emissions</p>	
<p><b>CAR 15:</b> Please explain the followings:</p> <ol style="list-style-type: none"> <li>1. COD<sub>out,x</sub> (COD of the effluent in period x): The project activity is a green-field project and hence in line with the methodology 120 mg/l design parameter has been considered. However, PP is requested to provide the exact source reference in PDD and ER worksheet.</li> <li>2. COD<sub>in,x</sub> (COD directed to the open lagoon): The project activity is a green-field project and hence in line with the methodology 42,000 mg/l design parameter has been considered.</li> </ol>	<p>B.6.1.2, B.6.1.4</p> <p>B.6.1.3,</p>	<ol style="list-style-type: none"> <li>1. The source of reference for all values considered in the baseline emission calculations are taken from the Report for Anaerobic Lagoon provided by local expert Namsai 304 Company Ltd. The source of all values (including COD<sub>out,x</sub>) is now provided in PDD and ER worksheet.</li> <li>2. The source of reference for all values considered in the baseline emission calculations are taken from the Report for Anaerobic Lagoon provided by local expert Namsai 304 Company Ltd. The source of all values (including COD<sub>in,x</sub>) is now provided in PDD and ER worksheet.</li> </ol>	<ol style="list-style-type: none"> <li>1. COD<sub>out,x</sub> (COD of the effluent in period x): In line with methodology PP considered 120 mg/l as per the baseline report prepared by Namsai 304 Company Ltd. Since, the project is a green field project, the response is accepted <b>query is closed</b>.</li> <li>2. COD<sub>in,x</sub> (COD directed to the open lagoon): In line with methodology PP considered 42,000 mg/l as per the baseline report prepared by Namsai 304 Company Ltd. Since, the project is a green field project, the response is accepted <b>query is closed</b>.</li> <li>3. Discount factor '1' for historical information has been considered in the</li> </ol>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
<p>However, PP is requested to provide the exact source reference in PDD and ER worksheet</p> <p>3. <math>\rho</math> (Discount factor for historical information) has not been included.</p> <p>4. D (Average depth of the lagoon): The project activity is a green field project activity and hence it has to be identified as per the baseline lagoon design as identified in step 1 of the section "Procedure for the identification of the most plausible baseline scenario Identification of alternative scenarios"; However the source of data and the choice of data or measurement methods and procedures are not transparently outlines in the PDD. Also in section B.2 of the PDD, it is stated that depth of lagoon is 7 meter whereas in other sections of the PDD it is mentioned as 6 meter. Kindly clarify</p> <p>5. PP is requested to clarify where <math>f_{CH_4, default}</math> (Default value for the fraction of methane in the biogas) is applied in the project activity.</p> <p>6. PP is requested to clarify where <math>\rho_{CH_4}</math> (Default value for density of <math>CH_4</math> at normal conditions) is applied in the project activity.</p> <p>7. <math>EF_{CH_4, default}</math> (Default emission factor for the fraction of <math>CH_4</math> produced that leaks from the anaerobic digester): It is not transparent in the PDD which value is used and the choice of data.</p>		<p>3. As per the methodology ACM0014 (v05.0.0) the discount factor for the Greenfield project activity is 1, this is now included in the ER worksheet and the PDD.</p> <p>4. As per the study carried out by the local expert Namsai 304 Company Ltd. and summarized in the Report for Anaerobic Lagoon depth of lagoon considered in the baseline is 6m and it is now consistent in the PDD. The procedures are now transparently mentioned in the PDD on page 15.</p> <p>5. The <math>f_{CH_4, default}</math> default value is applied to calculate the fraction of methane in the biogas as per Step 1 and the formula:  <math display="block">Q_{CH_4, y} = Q_{biogas, y} * F_{CH_4, default} * P_{CH_4}</math> to calculate <u>ex ante</u> project emissions.</p> <p>6. The <math>\rho_{CH_4}</math> default value is applied to calculate the fraction of methane in the biogas as per Step 1 and the formula:  <math display="block">Q_{CH_4, y} = Q_{biogas, y} * F_{CH_4, default} * P_{CH_4}</math> to calculate <u>ex ante</u> project emissions</p> <p>7. The choice of the data and value considered for <math>EF_{CH_4, default}</math> is now mentioned in the PDD (page 43)</p> <p>8. Ideal gas constant (R), <math>T_1</math> and Activation energy constant (E) is now included in the PDD in section B.6.2</p>	<p>revised PDD and ER worksheet in line with the methodology. Response is accepted and <b>query is closed</b>.</p> <p>4. Average depth of the baseline lagoon to be 6 meter has been identified as per the third party baseline report and data parameters are presented in the revised PDD. The same is made consistent throughout the PDD. Response is accepted and <b>query is closed</b>.</p> <p>5. PDD is corrected and hence response is accepted and <b>query is closed</b>.</p> <p>6. PDD is corrected and hence response is accepted and <b>query is closed</b>.</p> <p>7. PDD is corrected and hence response is accepted and <b>query is closed</b>.</p> <p>8. PDD is corrected and hence response is accepted and <b>query is closed</b>.</p> <p>9. PDD is corrected and hence response is accepted and <b>query is closed</b>.</p> <p>In summary, <b>CAR is closed</b>.</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
<p>8. Ideal gas constant (<math>R</math>), <math>T_1</math> and Activation energy constant (<math>E</math>) are not included in section B.6.2 of the PDD.</p> <p>9. <math>MM_{k/i}</math> (Molecular mass of gas <math>k</math> or <math>i</math>): Kindly specify the gas referred in the project activity.</p>		<p>9. The gas referred in the project activity is methane (<math>CH_4</math>) and same is mentioned in the PDD.</p>	
<p><b>CAR 16:</b></p> <p>1. QA/QC procedures are not specified for <math>F_{PJ,dig,m}</math> (Quantity of wastewater that is treated in the anaerobic digester or under clearly aerobic conditions in the project activity in month <math>m</math>).</p> <p>2. PP is requested to clarify how the monitoring of <math>COD_{eff,lag,m}</math> (Chemical oxygen demand in the effluent from the open lagoon or dewatering facility) is relevant in the project activity.</p> <p>3. PP is requested to clarify which parameter '<math>FV_{RG,h}</math>' is referring in the PDD and in line with the tool.</p> <p>4. <math>v_{i,t,db}</math> (Volumetric fraction of methane in the residual gas in the hour <math>h</math>): the QA/QC procedures are not in line with the methodology.</p> <p>5. <math>EC_{PJ,y}</math> (Amount of electricity consumed at the project site in a year): Calibration frequency and QA/QC procedures are not specified in the PDD. However, the notation and the description are not in line with the methodology.</p>	<p>B.6.2.2, B.6.2.3, B.6.2.4, B.6.3.2</p>	<p>1. QA/QC procedures are now specified for <math>F_{PJ,dig,m}</math> in section B.7.1</p> <p>2. The <math>COD_{eff,lag,m}</math> (Chemical oxygen demand in the effluent from the open lagoon or dewatering facility) is not relevant in the project activity but it is the COD of effluent at the discharge point. The nomenclature of the same is rectified in the PDD.</p> <p>3. The parameter '<math>FV_{RG,h}</math>' is not required in the PDD and as per tool and hence is eliminated from the PDD.</p> <p>4. QA/QC procedures for <math>v_{i,t,db}</math> (Volumetric fraction of methane in the residual gas in the hour <math>h</math>): are rectified and are now in line with the PDD.</p> <p>5. QA/QC procedures and the notation and description is now in line with the methodology and the same is rectified in the PDD.</p> <p>6. The recording frequency for <math>S_{LA,y}</math></p>	<p>1. QA/QC procedures for the parameter <math>F_{PJ,dig,m}</math> (Quantity of wastewater that is treated in the anaerobic digester or under clearly aerobic conditions in the project activity in month <math>m</math>) has been included in the revised PDD. The monitoring flow meter will be calibrated at least once in three years. Response is accepted and <b>query is closed</b>.</p> <p>2. PDD is corrected and hence accepted by the validation team. <b>Query is closed</b>.</p> <p>3. PDD is corrected and hence accepted by the validation team. <b>Query is closed</b>.</p> <p>4. The monitoring parameter is missing in the PDD. <b>Query is open</b>.</p> <p>5. The notations and description used in section B.7.1 of the PDD is not consistent in section B.6.1 of the PDD. <b>Query is open</b>.</p> <p>6. As per the methodology ACM0014, version 05, the monitoring frequency of quantity of sludge applied to land in year <math>y</math> is continuous with monthly aggregate.</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
6. $S_{LA,y}$ (Quantity of sludge applied to land in year $y$ ): the recording frequency is not included in the PDD.		<p>(Quantity of sludge applied to land in year <math>y</math>) is now included in the PDD.</p> <p><b>2<sup>nd</sup> Response:</b></p> <p>4. The monitoring parameter is now included in the PDD on page 59</p> <p>5. The notations and description used in section B.7.1 of the PDD and in section B.6.1 of the PDD are rectified and are now consistent in both the sections.</p> <p>6. The monitoring frequency for quantity of sludge applied to land is mentioned on page 62 of the PDD and now in line with the methodology</p>	<p>However, the PDD is not in line with the methodology. <b>Query is open.</b></p> <p>PP is requested to respond to the open queries. <b>CAR is open.</b></p> <p><b>2<sup>nd</sup> Review:</b></p> <p>All monitoring parameters are included in line with the methodology and tools.</p> <p>All notations used in the PDD are in line with the methodology and tools and are consistent throughout the PDD.</p> <p>Monitoring frequency of sludge applied to land is now corrected and in line with the methodology.</p> <p>Response is accepted and <b>CAR is closed.</b></p>
<b>CAR 17:</b> Day to day record handling ((including what records to keep, storage area of records and how to process performance documentation) procedures are not included in the PDD.	B.6.3.1	All the procedures for recording the data and handling, storage of records are now included in the PDD in section B.7.3	PDD is revised and necessary monitoring procedures and data handling measures are included in the PDD. Response is accepted and <b>CAR is closed.</b>
<b>CAR 18:</b> As per the section C.2.2 of the PDD, the expected starting date of crediting period is 01/12/2012 or date of registration of the project activity with UNFCCC whichever is later. However the date is not realistic considering the length of validation of the project activity. Therefore, PP is requested to consider a realistic start date for the first crediting period	C.1.1	The starting date of crediting period for the project activity is corrected to "Date of commissioning of the Biogas plant or date of request for registration of the project activity with UNFCCC whichever is later.	PP has revised the starting date of crediting period to be from the date of commissioning of the project activity or from the date of request for registration at UNFCCC. Since the project is expected to be commissioned in the first quarter of 2013, the crediting period can only start from the commissioning of the project even it is registered at UNFCCC. Hence, response is accepted and <b>CAR is closed.</b>
<b>CAR 19:</b> PP is requested to provide the environmental regulation applicable for the type of project activity in the host country and copy of environment clearance.	D.1.1, D.1.2, D.1.3, D.1.4, E.1.5	The environmental regulation applicable to the type of project activity in the host country can be found directly on the following website:	As per host country regulations EIA is not necessary. This is further confirmed from the legal declaration from a law firm called Hunton & Williams (Thailand) Limited. Further, the project has received host

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		<a href="http://www.pcd.go.th/info_serv/en_reg_std_water04.html">http://www.pcd.go.th/info_serv/en_reg_std_water04.html</a>  Further as per the Ministry of Natural Resources and Environment, Type and size of project/corporate EIA report, rule procedure and guideline for preparation of EIA, Biogas plant (the project activity) is not included in the list of project/corporate required preparing EIA. A copy of the legal opinion by a Thailand based law firm on requirements of EIA report is submitted as reference to the DOE.  Other applicable approvals for the project activity are submitted to the DOE.	country approval from Ministry of Natural Resources and Environment. Hence, response is accepted and <b>CAR is closed</b> .
<b>CAR 20:</b> Date of invitation to stakeholders and stakeholder categories are not mentioned in the PDD	E.1.1, E.1.2	The date of invitation to stakeholders and stakeholder categories are mentioned in the PDD. <hr/> <b>2<sup>nd</sup> Response:</b> The advertisement date for stakeholder meeting is 09/05/2008, the typographical error is now rectified in the PDD. Also the date of personal invitation is mentioned in the PDD on page 72.	PDD states advertisement date as 09/05/2012 when the meeting was held on 23/05/2008. Kindly explain. Further, date of personal invitation sent to stakeholders is not included in the PDD. <b>CAR is open.</b> <hr/> <b>2<sup>nd</sup> Review:</b> The PDD is corrected and advertisement date is made as per the actual date i.e. 09/05/2008. This is cross checked with the advertisement copy and found to be correct. Response is accepted and <b>CAR is closed</b> .
<b>CL 1:</b> As per the PDD, the operation lifetime of the project activity is 15 years. However, PP is requested to provide supporting document for the same.	A.5.4	The biogas plant is under construction, therefore, the PP have not received the lifetime certificate from the technology provider.  However, the lifetime of 15 years is	Since the technology provider is selected for the project activity, technical specifications from technology supplier for the lifetime of the project activity is necessary. <b>CL is open.</b> <hr/> <b>2<sup>nd</sup> Review:</b>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>considered from the reference provided by the TGO (Thailand Greenhouse Gas Management Organization, DNA Thailand) for the projects that are already operational, located in the same region and similar to the project activity.</p> <p>The list of project s can be found on the following weblink:  <a href="http://www.tgo.or.th/english/index.php?option=com_content&amp;view=article&amp;id=2%3Aapproved-projects&amp;catid=32%3Athailand-cdm-projects&amp;Itemid=72&amp;limitstart=2">http://www.tgo.or.th/english/index.php?option=com_content&amp;view=article&amp;id=2%3Aapproved-projects&amp;catid=32%3Athailand-cdm-projects&amp;Itemid=72&amp;limitstart=2</a> .</p> <p><b>2<sup>nd</sup> Response:</b>  The technical specification from technical supplier for the lifetime of the project activity is provided to the DOE.</p>	<p>The certificate from the equipment manufacturer (IC reactor) has been provided which justify the equipment life as 15 years. Hence, <b>CL is closed</b></p>
<p><b>CL 2:</b>  PP is requested to provide documentary evidence for the source of funding of the proposed project activity</p>	A.6.1, A.6.2	<p>The documentary evidence for source of funding is now provided to the DOE.</p> <p><b>2<sup>nd</sup> Response:</b>  The declaration is now submitted on the official letter head to the DOE.  The extract of loan document provided to the DOE is now translated in English highlighting the purpose of loan.</p>	<p>The declaration submitted in not on official letter head. Further, kindly highlight (with English translation) in the loan agreement copy, the purpose of the loan. <b>CL is open.</b></p> <p>The revised document has been submitted. Further, the declaration form the Double A Ethanol Company Limited substantiates the purpose and details of loan status. Hence, response is accepted and <b>CL is closed.</b></p>
<p><b>CL 3:</b>  Please explain the following and provide credible reference where necessary:  1. PP is requested to provide credible evidence based on which design</p>	B.3.2	<p>1. The design parameters identified in the table 4.1 of the PDD are obtained from the Report for Anaerobic lagoon. These values are summation of the parameters provided on page 11 of the report.</p>	<p>1. The design parameters of baseline lagoon are from the third party report. Further, the maximum depth as recommended by Department of Industrial Works</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
<p>parameters of a particular wastewater stream has been identified in table B4.1 of the PDD. Also clarify why only one design option has been identified.</p> <p>2. PP is requested to provide the reference document for footnote 11, 12, 13 and clarify how it has been lagoon depth of 6 meter is considered appropriate since Annex 3 is not included in the PDD as referred in footnote 8 of the PDD.</p> <p>3. Provide credible source based on which it is stated that there is no national and/or sectoral policies or regulations before 11 December 1997 that give comparative advantages to more emissions-intensive technologies or fuels over less emissions intensive technologies or fuels in local area and there is no national and/or sectoral policies or regulations after Nov. 11th, 2001 that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs) in the local area.</p> <p>4. PP is requested to provide the notification of Ministry of Science, Technology and Environment issue no. 3, B.E.2539</p>		<p>Further, in above sections of the report the experts have identified 6m depth for lagoons as ideal and practical for consideration. Therefore, only design option with 6m depth for the anaerobic lagoons in the baseline is considered.</p> <p>Also, as per the guideline published by Department of Industrial Works (DIW) of Thailand's Ministry of Industry for Ethanol Industrial Factory has recommended the depth of lagoon 3-6 meters. Therefore, considering the maximum lagoon depth to improve the efficiency of the system, depth of 6m for the lagoons is justifiable and has been considered by the local expert.</p> <p>2. The Report for Anaerobic lagoon provided by the local expert identifies 6m depth for anaerobic lagoon in the baseline ideal and practical for implementation. The report is already been provided to the DOE which also referred in the footnotes in the PDD.</p> <p>There was a typing error and no Annex 3 is included in the PDD, hence the footnote is now revised to the appropriate reference.</p> <p>3. There are no sectoral policies or regulations before 11<sup>th</sup> December 1997 that give comparative advantages to more emissions-intensive technologies or fuels over less emissions intensive technologies or fuels in local area and there are no national and/or sectoral</p>	<p>(DIW) of Thailand's Ministry of Industry for Ethanol Industrial Factory has been considered. Hence, response is accepted and <b>query is closed</b>.</p> <p>2. The PDD is revised. As per Department of Industrial Works (DIW) of Thailand's Ministry of Industry for Ethanol Industrial Factory the recommended depth of lagoon is 3 – 6 meter. Further, as per Wastewater technology factsheet from United States Environment Agency report an anaerobic lagoon is recommended to be as deep as possible. Hence, maximum deep of 6 meter has been considered by PP which should be most efficient as per above guidelines. Hence, response is accepted and <b>query is closed</b>.</p> <p>3. Kindly include the source in the PDD based on which the statement has been presented. <b>Query is open</b>.</p> <p>4. The notification referred has been cross checked by the validation team and found to be in line with the explanations presented in the PDD. Hence, <b>query is closed</b>.</p> <p>PP is requested to respond to the open queries. <b>CL is open</b>.</p> <p><b>2<sup>nd</sup> Review:</b></p> <p>The source based on which the national and sectoral policies are discussed has</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>policies or regulations after Nov. 11th, 2001 that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs) in the local area which can be verified from the websites provided as follows:</p> <ul style="list-style-type: none"> <li>• <a href="http://www.eppo.go.th/index-.html">http://www.eppo.go.th/index-.html</a></li> <li>• <a href="http://www.eppo.go.th/doc/doc-manage.html">http://www.eppo.go.th/doc/doc-manage.html</a></li> <li>• <a href="http://www.dede.go.th/dede/index.php">http://www.dede.go.th/dede/index.php</a></li> </ul> <p>4. The notification of Ministry of Science, Technology and Environment issue no. 3, B.E.2539 is now provided to the DOE.</p> <p><b>2<sup>nd</sup> Response:</b> The sources are included in the PDD on page 16 footnote 23.</p>	<p>been transparently presented in the PDD in section B.4. Hence, response is accepted and <b>CL is closed</b>.</p>
<p>CL 4:</p> <p>PP is requested to submit the copy of the CDM development mandate letter dated 01/02/2008 signed by PP (M/s Double A Ethanol Company Limited). In addition, PP is requested to provide the documentary evidence for the negotiations taken for CDM development and CER sales in March 2010, term sheet sent to project owner dated 29/07/2011 and the revised mandate letter signed on 23/01/2012</p>	B.4.3.3, B.4.3.4	<p>The copies of all mentioned documents are now provided to the DOE.</p> <p><b>2<sup>nd</sup> Response:</b> Documentary evidence for 'Mail correspondence on terms and conditions for CDM development and CER sales' is now being submitted to the DOE.</p> <p>The date of contract with RINA for validation mentioned in the PDD was a typographical mistake which is now</p>	<p>Documentary evidence for 'Mail correspondence on terms and conditions for CDM development and CER sales' not submitted to the validation team. Further, contract with RINA for validation of the project activity executed on 16/07/2012 whereas, the PDD mentioned as 23/06/2011. Kindly explain. <b>CL is open</b>.</p> <p><b>2<sup>nd</sup> Review:</b> Copy of e-mail communication from July 2009 to November 2009 between Double</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		rectified in the PDD.	A Ethanol Company Limited and Climate Change Capital Limited has been submitted to justify that continuous CDM process was in place parallel to the implementation of the project activity. Response is accepted and <b>CL is closed</b> .
<p>CL 5: PP is requested to clarify the following:</p> <ol style="list-style-type: none"> <li>1. Provide exact reference of the interest rate considered as 7.99% for the open lagoon system in consideration of investment decision.</li> <li>2. Provide exact reference for the tax rate considered as 30% in case of the open lagoon system applicable at the time of investment decision. Kindly provide the method of computation of income for tax purposes as per the local rules.</li> <li>3. Kindly provide the source for the fuel price considered for revenue calculation. Also, kindly provide the current price of fuel.</li> <li>4. Kindly provide the proposal for laboratory cost considered in operating cost. Kindly provide the source and evidence for PAM price, PAM consumption, caustic soda price, caustic soda consumption, electricity price, electricity consumption, water price, water consumption.</li> <li>5. Kindly provide the basis for the maintenance cost calculation. Kindly explain the basis for dividing the cost by 15 for each year maintenance cost</li> </ol>	<p>B.4.4.5, B.4.4.6, B.4.4.9, B.4.4.10</p>	<p>1.The reference to the rate considered as 7.99% for the open lagoon system in consideration of investment decision is provided in the NPV sheet in the worksheet named FOREX &amp; MLR (row 59)</p> <p>2. The reference of tax rate is now provided to the DOE. The reference document provides computation of income tax purposes as per the local rules. Weblink: <a href="http://www.rd.go.th/publish/6044.0.html">http://www.rd.go.th/publish/6044.0.html</a></p> <p>3. The fuel price considered for revenue calculation has been taken from the historical records of the lime kiln and as well can be verified from the following weblink: <a href="http://www.eppo.go.th/petro/price/index.html">http://www.eppo.go.th/petro/price/index.html</a></p> <p>The current fuel price can be sourced from the following weblink: <a href="http://www.eppo.go.th/info/8prices_stat.htm">http://www.eppo.go.th/info/8prices_stat.htm</a></p> <p>4. The supporting document for all the parameters is provided to the DOE.</p>	<ol style="list-style-type: none"> <li>1. Verified the web link provided for the interest rates and hence accepted.</li> <li>2. As per the link provided tax depreciation specified separate depreciation rates, kindly confirm even with the tax depreciation rates the profits are negative. Also, kindly explain the basis for considering 30% as tax rate and whether the rate was the same at the time of decision making. <b>Query is open.</b></li> <li>3. The fuel price considered and the current price could not be traced to the link provided, kindly clarify. <b>Query is open.</b></li> <li>4. Proposal for laboratory cost is not submitted to the validation team. For water price the reference document indicates a price of 29 THB/m<sup>3</sup> whereas, the worksheet mentioned as 24 THB/m<sup>3</sup>. The quotation submitted for PAM and costa soda price is dated 26/10/2012 whereas the investment decision date is 19/11/2007. In that case how the input values are applicable at the time of investment decision. <b>Query is open.</b></li> </ol>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
<p>calculation.</p> <p>6. Kindly provide the offer letter from the supplier for the project cost considered. Kindly provide the actual cost details with invoices raised.</p> <p>7. Kindly provide the basis for considering the life of the asset for 15 years.</p> <p>8. Kindly provide the basis for depreciation calculation.</p> <p>9. Kindly provide the basis for the interest rate, tenure of loan, grace period and the basis for the D/E ratio. Kindly explain the calculation of loan amount.</p> <p>10. Kindly provide the loan sanction letter and current status of loan</p>		<p>5. The maintenance cost calculation is considered as % over the project cost, which is given in the NPV calculation sheet in "Summary and assumption worksheet". The O&amp;M of the plant would be executed by PP itself. The approach for calculation of O&amp;M was considered based on discussion with technology provider and estimated accordingly for successive years.</p> <p>Since the project cost is estimated to be depreciated over the lifespan of 15 years, hence 'for annual maintenance cost' the total cost is divided by 15 to express it as a value for one year and then specific % of maintenance cost is applied to calculate yearly expense.</p> <p>This approach is confirmed by PP as an accounting practice to be adopted for this project. A declaration from the accounts dept. is submitted to DOE as a source of consideration.</p> <p>6. The project costs are considered from Siemens Proposal (Appendix of the Proposal) which is provided by the technology supplier and is already submitted to the DOE.</p> <p>The actual cost details are provided in the invoices raised which are now being submitted to the DOE</p> <p>7. The biogas plant is under construction and is yet to be implemented and</p>	<p>5. The justification has been accepted considering accounting practice. <b>Query is closed.</b></p> <p>6. The project cost is as per the proposal submitted by the technology supplier dated 05/10/2007 which was available at the time of investment decision. Hence, accepted by the validation team.</p> <p>7. Since the technology provider is selected for the project activity, technical specifications from technology supplier for the lifetime of the project activity is necessary. <b>Query is open.</b></p> <p>8. The calculation is accepted considering general accounting practice. <b>Query is closed.</b></p> <p>9. Justification is accepted and <b>query is closed.</b></p> <p>10. Loan sanction letter has been submitted by PP. The interest rate indicated as minimum lending rate (MLR) minus 0.5 percent. <b>Query is closed.</b></p> <p>PP is requested to respond to the open queries. <b>CL is open.</b></p> <p><b>2<sup>nd</sup> Review:</b></p> <p>Tax rate is considered as per tax rate from the Revenue Department, Thailand. Hence accepted.</p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>commissioned, therefore, the PP have not received the lifetime certificate from the technology provider.</p> <p>However, the lifetime of 15 years is considered from the reference provided by the TGO (Thailand Greenhouse Gas Management Organization, DNA Thailand) for the projects that are already operational, located in the same region and similar to the project activity. The source for the weblink is provided in table CL-1 above.</p> <p>8. Equal amount of depreciation amount has been considered for the 15 years for IRR calculation as per the accounting practice of project proponent.</p> <p>9. Interest rate, tenure of loan, grace period has been considered from the Publically available information at the of decision making. Source for the information is being provided to DOE <a href="http://www.bot.or.th/">http://www.bot.or.th/</a>.</p> <p>The applicable D/E ratio for similar industries in the host country has been considered for the project activity. The calculation was based on the data published by the Stock Exchange of Thailand. The raw data is from the source:  <a href="http://www.set.or.th/en/market/market_statistics.html#annual">http://www.set.or.th/en/market/market_statistics.html#annual</a> .</p> <p>The average annual D/E data of 2006, 2007of group: 7. Agro &amp; Food Industry –</p>	<p>The FO price is taken as per the rate of Energy Policy &amp; Planning Office, Ministry of Energy, Thailand. Hence, accepted.</p> <p>Laboratory cost is as per the quotation available at the time of investment decision. The water tariff applicable at the time of investment decision has been submitted by the PP and it justifies the waste tariff as 24BHT/m<sup>3</sup>. Further the PAM and caustic soda cost is as per proposal available at the time of investment decision. The proposal copy has been submitted to the validation team. Hence, accepted.</p> <p>The certificate from the equipment manufacturer (IC reactor) has been provided which justify the equipment life as 15 years. Hence, accepted.</p> <p>In summary, <b>CL is closed.</b></p>

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>Agribusiness has been considered. The calculation has been summarized in the NPV sheet under "FOREX&amp;MLR" sheet and linked with the input values. For the relevant source/references, the qtrly complied sheets for the year 2005, 2006 &amp; 2007 (till prior to the investment decision date) have been submitted to DOE. These sheets are also publically available in the SET website.</p> <p>The loan amount is estimated as the present value of the annuity, which is the stream of payments that will be made on the loan.</p> <p>To estimate an loan amount, following formula has been considered :  <math>\text{Loan Amount} = \text{Total Investment} \times \text{Debt-to-Capital (D/C)}</math>;  where <math>D/C = D/(D+E) = D/E / (D/E + 1)</math>.  Hence, <math>\text{Loan Amount} = \text{Total Investment cost} \times [D/E / (D/E + 1)]</math>. Please refer to the cell B40 in "Base Case" sheet in the NPV spreadsheet.</p> <p>10. The loan has been sanctioned to PP, and a portion of the sanctioned amount has been disbursed recently.</p> <p>The loan sanction letter is now provided to the DOE.</p> <hr/> <p><b>2<sup>nd</sup> Response:</b></p> <p>2. The NPV with tax depreciation rate has also been considered in a different sheet "Base case with IT Dep Rate" to show the NPV at the prescribed rates. As provided in the link for Revenue</p>	

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>Department (<a href="http://www.rd.go.th/publish/6044.0.html">http://www.rd.go.th/publish/6044.0.html</a>), the IT depreciation has been applied as per the section 5.2 "machinery acquired before December 31, 2010", under the table of the section 4 in the link provided, i.e. "initial allowance of 40% on the date of acquisition and the residual can be depreciated at the rate in 5".</p> <p>The depreciation calculation has been shown in Row 32-35 of the sheet. Also, to make the assessment more conservative the unabsorbed value (i.e. the residual value after depreciation, at 15th year) during this tax-depreciation has been added back to the cash flows at the 15th year. Please refer to the cell R25 of the sheet. It can be observed that the even with the tax depreciation rates and added value of un-depreciated asset, the profits are negative and hence NPV is negative.</p> <p>The tax rate, i.e. 30% was also applicable at the time of investment decision.</p> <p>It can be further verified from the following -  <a href="http://www.worldservicesgroup.com/guides/Thailand%20Tax%20Guide.pdf">http://www.worldservicesgroup.com/guides/Thailand%20Tax%20Guide.pdf</a></p> <p>3. The current fuel price can be traced from the link that has been already provided in above. The spread sheet containing information of fuel price can be downloaded by clicking on the date provided on the webpage.</p>	

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation Conclusion
		<p>4. The documentary evidence for laboratory cost is now provided to the DOE</p> <p>The reference document for water price and consumption is provided to the DOE and is in line with the water price considered in the NPV calculation sheet.</p> <p>The relevant supporting document for PAM and caustic soda cost is provided to DOE that was referred during the investment decision period.</p> <p>7. The certificate for lifetime of the equipment provided by the technology supplier is now provided to the DOE</p>	

**TABLE 4 FORWARD ACTION REQUEST**

Forward action request	Reference to Table 2	Response by project participants	Validation Conclusion
<p><b>FAR 1:</b></p> <p>Since the project activity is yet to be commissioned, the sludge generation and its transportation for land application procedure could not be checked during the site visit. From the description of its management it can be assumed that there will not be any anaerobic degradation leading to methane emissions. However, this will be cross checked during first verification in compliance with the latest applicable tool 'project and leakage emissions from anaerobic digester'.</p>	B.1.3, B.5.3.1, B.5.3.2, B.5.3.3	<p>The PP ensures that the sludge will be stored for maximum 2 days at the sludge storage facility. The PP will be maintaining records of quantity of sludge generated on daily basis in their log books during the operation of the project activity plant.</p> <p>During the crediting period the quantity of sludge provided to the farmers can be verified through receipts of sale of amount of sludge and the quantity of sludge sent for land application can be verified through the gate pass issued for vehicle used for transportation of the sludge for land application. Thus, it can be verified from the records of sludge produced and sold or sent for land application that the sludge is not stored for longer periods at the project site.</p> <p>Further, the project system efficiently removes of 90% of total organic matter in the anaerobic digester and therefore the sludge generating rates are lower. Hence, it is evident that storage of small quantity of sludge for 2 days will not lead to any fugitives emissions.</p>	



RINA

## CERTIFICATO DI QUALIFICA QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra:  
*We declare that Mr/Mrs/Ms:*

**Rekha Menon**

è qualificato come<sup>1</sup>:  
*is qualified as:*

CDM-TEC, CDM-VAL, CDM-VER, CDM-TL, CDM-FIN-EXP,  
VCS-TEC, VCS-VAL, VCS-VER, VCS-TL,  
GS-TEC, GS-VAL, GS-VER, GS-TL,  
SCS-TEC, SCS-VAL, SCS-VER, SCS-TL  
JI-TEC

per le seguenti aree tecniche:  
*for the following technical areas:*

**1.2, 13.1**

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.2	Energy generation from renewable energy sources	1
13.1	Waste Handling and Disposal	13

in accordo alle istruzioni della Divisione Certificazione.  
*in accordance with the instructions of the Certification Division.*

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	06-03-2008	-
7	01-06-2012	Annual revision

Il Resp. QPT  
*Head of QPT*

<sup>1</sup> Legend:

VAL: Validator  
VER: Verifier  
TEC: Technical Expert  
TL: Team Leader  
FIN-EXP: Financial Expert  
DET: Determiner

CDM: Clean Development Mechanism  
VCS: Verified Carbon Standard  
GS: Gold Standard  
SCS: SocialCarbon Standard  
JI: Joint Implementation

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RINA

## CERTIFICATO DI QUALIFICA QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra:  
We declare that Mr/Mrs/Ms:

Champak Buragohain

è qualificato come<sup>1</sup>:  
is qualified as:

CDM/VCS/GS/JI/SCS-TEC, CDM-VAL

per le seguenti aree tecniche:  
for the following technical areas:

1.2, 2.1, 13.2, 15.2

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.2	Energy generation from renewable energy sources	1
2.1	Electricity distribution	2
13.2	Animal Waste Management	13
15.2	Animal Waste Management	15

in accordo alle istruzioni della Divisione Certificazione.  
in accordance with the instructions of the Certification Division.

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	19-01-2011	-
4	01-06-2012	Annual revision

Il Resp. QPT  
Head of QPT

<sup>1</sup> Legend:

VAL: Validator  
VER: Verifier  
TEC: Technical Expert  
TL: Team Leader  
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**RINA**

## CERTIFICATO DI QUALIFICA QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra:  
*We declare that Mr/Mrs/Ms:*

**Kumar Praveen Krishnan**

è qualificato come<sup>1</sup>:  
*is qualified as:*

**CDM-TEC, CDM-VAL, CDM-VER  
VCS-TEC, SCS-TEC, JI-TEC  
GS-TEC, GS-VAL, GS-VER**

per le seguenti aree tecniche:  
for the following technical areas:

**1.1, 2.2, 4.10, 13.1**

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.1	Thermal energy generation from fossil fuel and biomass including thermal electricity from solar	1
2.2	Heat Distribution	2
4.10	Fuel switching and/or energy efficiency and/or waste heat/gas/pressure recovered and utilization for power generation at manufacturing industries	4
13.1	Waste Handling and Disposal	13

in accordo alle istruzioni della Divisione Certificazione.  
*in accordance with the instructions of the Certification Division.*

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	09-12-2010	-
5	01-06-2012	Annual revision

Il Resp. QPT  
Head of QPT

<sup>1</sup> Legend:

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VER: Verifier  
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TL: Team Leader  
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RINA

## CERTIFICATO DI QUALIFICA QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra:  
We declare that Mr/Mrs/Ms:

Karthika Varma

è qualificato come<sup>1</sup>:  
is qualified as:

CDM-FIN-EXP

per le seguenti aree tecniche:  
for the following technical areas:

-

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
-	-	-

in accordo alle istruzioni della Divisione Certificazione.  
in accordance with the instructions of the Certification Division.

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	20-10-2010	-
2	01-06-2012	Annual revision

Il Resp. QPT  
Head of QPT

<sup>1</sup> Legend:

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RINA

## CERTIFICATO DI QUALIFICA QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra:  
We declare that Mr/Mrs/Ms:

Reghu Raghavan Nair Kumar

è qualificato come<sup>1</sup>:  
is qualified as:

CDM-TEC, CDM-VAL, CDM-VER, CDM-TL, CDM-FIN-EXP  
VCS-TEC, VCS-VAL, VCS-VER, VCS-TL  
GS-TEC, GS-VAL, GS-VER, GS-TL  
SCS-TEC, SCS-VAL, SCS-VER, SCS-TL  
JI-TEC

per le seguenti aree tecniche:  
for the following technical areas:

1.1, 1.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1, 6.1, 11.1, 13.1

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.1	Thermal energy generation from fossil fuel and biomass including thermal electricity from solar	1
1.2	Energy generation from renewable energy sources	1
4.3	Iron and steel	4
4.4	Refinery	4
4.5	Rubber and Plastics	4
4.6	Electrical/electro technical products	4
4.7	Coke/coal/char-coal production	4
4.8	Pulp and paper production	4
5.1	Chemical process industries	5
6.1	Construction	6
11.1	Chemical process industries	11
13.1	Waste Handling and Disposal	13

in accordo alle istruzioni della Divisione Certificazione.  
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REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	31-08-2009	-
6	01-06-2012	Annual revision

Il Resp. QPT  
Head of QPT

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RINA

## CERTIFICATO DI QUALIFICA QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra:  
We declare that Mr/Mrs/Ms:

Rita Valoroso

è qualificato come1:  
is qualified as:

CDM-TEC, CDM-VAL, CDM-VER, CDM-TL, CDM-FIN-EXP  
VCS-TEC, VCS-VAL, VCS-VER, VCS-TL  
GS-TEC, GS-VAL, GS-VER, GS-TL  
SCS-TEC, SCS-VAL, SCS-VER, SCS-TL  
JI-TEC

per le seguenti aree tecniche:  
for the following technical areas:

1.2, 13.1

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.2	Energy generation from renewable Energy sources	1
13.1	Waste Handling and Disposal	13

in accordo alle istruzioni della Divisione Certificazione.  
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REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	18-01-10	-
6	13-07-12	Annual revision

Il Resp. QPT  
Head of QPT

<sup>1</sup> Legend:

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DET: Determiner

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RINA

## CERTIFICATO DI QUALIFICA QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra:  
We declare that Mr/Mrs/Ms:

Felice Alfieri

è qualificato come<sup>1</sup>:  
is qualified as:

CDM/VCS/GS/JI/SCS-TEC

per le seguenti aree tecniche:  
for the following technical areas:

13.2, 15.2

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
13.2	Animal Waste Management	13
15.2	Animal Waste Management	15

in accordo alle istruzioni della Divisione Certificazione.  
in accordance with the instructions of the Certification Division.

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	13-09-2010	-
4	01-06-2012	Annual revision

Il Resp. QPT  
Head of QPT

<sup>1</sup> Legend:

VAL: Validator  
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TL: Team Leader  
FIN-EXP: Financial Expert  
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VCS: Verified Carbon Standard  
GS: Gold Standard  
SCS: SocialCarbon Standard  
JI: Joint Implementation

RINA Services S.p.A. è accreditato da UNFCCC, quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM, da VCSA per condurre la Validazione e la Verifica di Progetti VCS, da GS Foundation, per condurre la Validazione e la Verifica di Progetti GS, da Ecologica Institute per condurre la Validazione e la Verifica di rapporti SCS

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