VALIDATION REPORT

METHANE RECOVERY FROM ADVANCED WASTEWATER TREATMENT SYSTEM IN AN ETHANOL PLANT IN THE PHILIPPINES

REPORT NO. 2010-0279

REVISION NO. 03

DET NORSKE VERITAS

VALIDATION REPORT

Date of first issue: 2010-03-19	ConCert Project No.: PRJC-199023-2009-CCS-NOR
Approved by Michael Lehmann	Organisational unit: Accredited Climate Change Services
Client: The International Bank for Reconstruction and Development as Trustee for the Community Development Carbon Fund (CDCF)	Client ref.: Julie Godin, Nat Pinnoi

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Summary:

Project Name: Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant
Country: Philippines
Methodology: ACM0014
Version: 4.1.0
GHG reducing Measure/Technology: Mitigation of GHG emissions from treatment of industrial wastewater
ER estimate: 101 122 tCO_2e per year (average)

Size

☒ Large Scale ☐ Small Scale

Validation Phases:

☒ Desk Review
☒ Follow up interviews
☒ Resolution of outstanding issues

Validation Status

☐ Corrective Actions Requested ☐ Clarifications Requested
☒ Full Approval and submission for registration ☐ Rejected

In summary, it is DNV's opinion that the project activity "Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant" in Philippines, as described in the PDD, version 13 of 17 July 2013, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0014, version 4.1.0. Hence DNV requests the registration of the project as a CDM project activity.

Report No.: 2010-0279	Subject Group: Environment
Report title: Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant in the Philippines	
Work carried out by: Marlene Fischer, Kamala Muniandy Devi, Agnes Dudek , Namboodri Krishnan, Khalid Fathullah Akmal, Wong Yon Sing, Ole Flagstad	
Work verified by: Wan Hasliza SM Jamaluddin, Michael Lehmann	
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Abbreviations

BM	Build Margin
BOD	Biochemical Oxygen Demand
CAR	Corrective Action Request
CDCF	Community Development Carbon Fund
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CH_4	Methane
CL	Clarification request
CM	Combined Margin
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
CPI	Consumer Price Index
DENR	Department of Environment and Natural Resources
DNA	Designated National Authority
DNV	Det Norske Veritas
ECC	Environmental Compliance Certificate
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ERPA	Emission Reduction Purchase Agreement
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GSC	Global Stakeholder Consultation
GWP	Global Warming Potential
HDPE	High density polyethylene
IENM	Ministry of Infrastructure and the Environment
IBRD	International Bank for Reconstruction and Development
IPCC	Intergovernmental Panel on Climate Change
LCMR	Low cost / must run
LoA	Letter of approval
mPhP	Million Philippine Pesos
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating Margin
PHP	Philippine Peso
PIN	Project Idea Note
PDD	Project Design Document
RHI	Roxas Holding Inc.
tCO_2e	Tonnes of CO_2 equivalents
UNFCCC	United Nations Framework Convention on Climate Change

1 EXECUTIVE SUMMARY – VALIDATION OPINION

DNV Climate Change Services AS (DNV) has performed a validation of the project activity "Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant" in the Philippines. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism as well as criteria given to provide for consistent project operations, monitoring and reporting.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfilment of stated criteria.

The host Party is Philippines and the Annex I Party is the Netherlands. Both Parties fulfil the participation criteria and have approved the project and authorized the project participants Roxol Bioenergy Corporation / Roxas Holdings Inc. (host) and The International Bank for Reconstruction and Development (IBRD) as Trustee for the Community Development Carbon Fund (CDCF) as well as the Designated National Authority of the Netherlands, the Ministry of Infrastructure and the Environment (lenM) from The Netherlands (Annex I). The DNA from Philippines confirmed that the project assists in achieving sustainable development.

The project correctly applies the baseline and monitoring methodology ACM0014, version 4.1.0 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater".

The project involves the installation of an anaerobic wastewater treatment facility (digester) at an ethanol plant to generate biogas, which is used for heat and electricity generation. As a result, the project results in reductions of CO_2 and CH_4 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 total emission reductions from the project are estimated to be on the average 101 122 tCO_2e per year over the selected 7 year renewable 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 DNV's opinion that the project participants are able to implement the monitoring plan.

In summary, it is DNV's opinion that the project activity "Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant" in the Philippines, as described in the PDD, version 13 dated 17 July 2013, meets all relevant UNFCCC requirements for the CDM and correctly applies the baseline and monitoring methodology ACM0014, version 4.1.0. Hence, DNV requests the registration of the project as a CDM project activity.

Oslo, 2013-08-09

Ole A. Flagstad
Validator
DNV Oslo, Norway

Michael Lehmann
Director of Services and Technologies
DNV Climate Change Services AS

2 INTRODUCTION

The International Bank for Reconstruction and Development as Trustee of the Community Development Carbon Fund (CDCF) has commissioned DNV Climate Change Services AS (DNV) to perform a validation of the "Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant" project in Philippines (hereafter called "the project"). This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, and the subsequent decisions by the CDM Executive Board.

2.1 Objective

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

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology ACM0014 (version 4.1.0) /87/. The validation was based on the recommendations in the Validation and Verification Manual /86/.

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

3 METHODOLOGY

The validation consisted of the following three phases:

I a desk review of the project design documents

II follow-up interviews with project stakeholders

III the resolution of outstanding issues and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Desk review of the project design documentation

The following tables list the documentation that was reviewed during the validation.

3.1.1 Documentation provided by the project participants

/1/ The World Bank Group: CDM-PDD for project activity "Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant" in the Philippines, version 01 dated 29 January 2010 (published for GSC), subsequent versions, and final version 13 dated 17 July 2013.

/2/ The World Bank Group: ER calculation spreadsheet, dated 18 December 2012; Project and baseline boiler ratio, filename : Boiler share.xls

/3/ The World Bank Group: IRR calculation spreadsheet, dated August 2010 (version 5).

/4/ The World Bank Group: 'Philippines Grid EF 06-08', dated July 2011.

/5/ CADP Group Corp.: Feasibility Study for Ethanol project for Roxas Holdings, Inc., dated 27 July 2007.

/6/ CADP Group Corp.: Draft plant layout, September 2007; cross-checked vs.
KBK Chem Engineering Pvt. Ltd.: Biogas plant process description, dated 23 July 2008 and plant layout dated 2009.

/7/ KBK Chem Engineering Pvt. Ltd.: Annexure to Contract for CADP Group Corp. for a 100 000 l per day using cane juice & cane molasses modern ethanol project, I-DOT complex, survey No. 13/3/7, dated 27 June 2008.

/8/ KBK Chem Engineering Pvt. Ltd.: Proposal for boiler 40 TPH and Paddle Mixer, dated 10 September 2008.

/9/ Roxol Bioenergy: Energy requirement of Ethanol Plant, Roxol Energy Balance, dated 2010.

/10/ L. Wong Sak Hoi: Calorific value of bagasse – an overview, (undated); and
The Biogas Technology Center Chiang Mai University, PPT presentation for the properties (heat value) of biogas.

/11/ KBK Chem Engineering Pvt. Ltd.: Biogas Burner Detail, dated 6 August 2010.

/12/ KBK Chem Engineering Pvt. Ltd.: Proposal for Turbine 4 MW, dated 30 July 2008.

/13/ KBK Chem Engineering Pvt. Ltd.: Zero liquid effluent discharge system (KBK/0813/PDS/702), dated 24 July 2008.

/14/ KBK Chem Engineering Pvt. Ltd.: Details of flare stack, dated 14 April 2009 and letter about flare specifications dated 6 August 2010.

/15/ KBK Chem Engineering Pvt. Ltd.: Project schedule 100 KLPD Distillery & Fuel Ethanol project, 2008-2009.

/16/ KBK Chem Engineering Pvt. Ltd.: Project Progress Report No. KBK-MPR-817-01, A/c. Roxol Bioenergy Corporation (progress as per 31 July 2008), dated 9 August 2008.

/17/ Roxol Bioenergy: Baseline Lagoon Design Report v3, dated 30 March 2010.

/18/ Republic of the Philippines: Certificate and Annex to articles of incorporation, 27 February 2008 & Transfer Certificate of Title (evidence for the legal status of the project entity), dated 1 August 2008.

/19/ Department of Environment and Natural Resources: Republic Act No. 9275 'Philippine Clean Water Act of 2004', 22 March 2004 and the Administrative Order 2005-10 – Implementing Rules and Regulations of the Philippine Clean Water Act of 2004.

/20/ DENR: Administrative Order No. 34, Series of 1990.

/21/ DENR: Administrative Order No. 35, Series of 1990.

/22/ CDCF: Emission Reduction Purchase Agreement (ERPA), 14 January 2009.

/23/ Roxol Bioenergy Corporation: Project Idea Note (PIN), 21 March 2007.

/24/ The World Bank: E-mail conversation with Roxol Bioenergy Corporation about the letter of intention, 1 May 2007.

/25/ Roxas Holding Inc.: Secretary's certificate issued by the Assistant Corporate Secretary of Roxas Holding Inc. to confirm regular board meetings held on 8 December 2005 and 27 September 2006 where the corporation was notified of the proposed CDM project, dated 4 March 2010.

/26/ CADP Group Corporation/Roxas Holdings Inc.: Extract of minutes of the joint special meetings of the board of directors, 15 November 2007.

/27/ Roxas Holding Inc.: Board meeting held on 15 November 2007, evidenced through a secretary's certificate issued by the Assistant Corporate Secretary of Roxas Holding Inc., dated 6 September 2010.

/28/ The World Bank: Request for revision of methodology ACM0014 (AM_REV_0078) http://cdm.unfccc.int/methodologies/Pamethodologies/revisions/20674

/29/ Roxol Bioenergy Corporation: Letter of Intent for CDM project, 15 September 2008.

/30/ CDM EB: Web-hosting of the PDD for Global Stakeholder Consultation; http://cdm.unfccc.int/Projects/Validation/DB/TEDQ47YBGWZXDX6UNSNCQIE1JUVVWA/view.html

/31/ KBK Chem Engineering Pvt. Ltd.: Transmittal No.: KBK-813-RBC-TRN-039 (letter provided as evidence for equipment lifetime), dated 2 April 2010.

/32/ KBK Chem Engineering Pvt. Ltd.: Transmittal No.: KBK-813-RBC-TRN-040 (letter provided as evidence for the CH4 content of biogas), dated 2 April 2010.

/33/ Najalin Agri-Ventures, Inc. and Roxol Bioenergy Corporation: Deed of absolute sale of real property, dated 10 July 2008.

/34/ Roxol Bioenergy Corporation: Purchase order M-1000025 supply labour and material for construction of holding lagoon with HDPE lining, dated 21 July 2009.

/35/ Central Azucarera de la Carlota Inc.: Purchase order L-320073 rental of dump truck (for sludge disposal), approved 22 January 2010.

/36/ National Power Corporation Philippines: Average price for electricity in 2007 (for the electricity tariff); available at: http://www.napocor.gov.ph/power%20rates/eff_rates_for_luzon_grid_prev.htm

/37/ GTZ: International Fuel Prices 2009, December 2009, available under : http://www.gtz.de/de/dokumente/gtz2009-en-ifp-full-version.pdf

/38/ Philippine Department of Energy: Oil Price Monitor for common fossil fuel prices May 2009 to July 2011, available at: www.doe.gov.ph/OPM/Archives.htm

/39/ Philipinas Shell: Pay slip for bunker – special fuel oil with 3% sulphur, dated 22 January 2007; and
Marketing Specifications Philippines (Shell fuel oil), presented in PPT presentation.

/40/ Cummins Power Generation Inc.: Generator set data sheet (for the average fossil fuel consumption in diesel engines),
Diesel Service Supply: Approximate Diesel Fuel Consumption Chart, available at: http://www.dieselserviceandsupply.com/Diesel_Fuel_Consumption.aspx

/41/ CADP Group Corporation: E-mail confirmation for the administrative and insurance cost of the project, dated 3 March 2011.

/42/ Inflation rate for Philippines: National Statistics office of the Philippines, http://census.gov.ph/data/sectordata/tscpimon.html

/43/ Mr Jose Maria T. Zabaleta: Will the Philippines revert to its net sugar exporter status, available at: http://www.fao.org/docrep/005/x0513e/x0513e17.htm (last accessed 5 October 2011).

/44/ Antonio V del Rosario: Philippine Cogeneration Outlook: Immediate Opportunities, 2004.

/45/ Philippine Department of Energy: Power Development Program (Power Supply Plan) http://www.doe.gov.ph/Downloads/PDP.pdf

/46/ Philippine Department of Energy: Confirmation letter on the availability of data to calculate the grid emission factor, e-mail dated 25 February 2011.

/47/ Philippine Bureau of Internal Revenue: National Internal Revenue Code (NIRC), chapter VII, allowable deductions. http://www.bir.gov.ph/taxcode/1781.htm

/48/ International Monetary Fund (IMF): Investment Incentives and Effective Tax
Rates in the Philippines: A Comparison With Neighboring Countries, September 2008.

/49/ J.N. Lester and J.W. Birkett: Microbiology and Chemistry for Environmental Scientists and Engineers, 2nd edition, undated (evidence for bacteria growth).

/50/ Beltran de Heredia, J.R. Dominguez and E. Partido: Physico-chemical treatment for the depuration of wine distillery wastewaters (vinasses),Water Science and Technology Vol 51 No 1 pp 159–166. IWA Publishing 2005.

/51/ Von Sperling, M., C.A. de Lemos Chernicharo and F. Fernandes: Biological Wastewater Treatment in Warm Climate Regions (chapter 14), dated , 2002.

/52/ Government of the Philippines: Philippines Sanitation Sourcebook and Decision Aid, page 7, (source provided is undated).

/53/ United States Environmental Protection Agency (EPA): Wastewater Technology Fact Sheet Anaerobic Lagoons, September 2002.

/54/ Bitton: Wastewater microbiology, Third Edition, John Wiley and Sons inc., 2005, p 220, table 7.3 (for the COD/BOD_5 ratio)

/55/ Map of the Negros with localization of the other plants in the region, 2010

/56/ Leyte Agri Corporation: Confirmation e-mail on anaerobic treatment, (undated).

/57/ CADP Group of Companies: Environmental Impact Assessment (EIA) for the Ethanol

Production and Wastewater Methane Capture Project, dated October 2008.

/58/ DENR: Environmental Compliance Certificate (ECC), dated 9 January 2009 (EIA approval).

/59/ European Biodiesel Board (EBB): Factsheet – An Economic and Security of Supply analysis of the widening EU Diesel Deficit, dated 1 October 2008.

/60/ Roxol Bioenergy: CDM monitoring plan, undated (for the emergency lagoon dimensions); and Technical specifications, dated 20 April 2009.

/61/ DENR: Implementing Rules and Regulations (IRR) for the Philippine Environmental Impact Statement (EIS) System (DENR Administrative Order No. 2003-30).

/62/ Philippine Department of Energy: DOE accredited bioethanol producers, as of 17 August 2009, available under: http://www.doe.gov.ph/AF/BioethanolAccredit.htm (last accessed 6 October 2011).

/63/ CDM Executive Board: PA 0931, registered as CDM project, on 13 April 2007; http://cdm.unfccc.int/Projects/DB/DNV-CUK1171455227.42/view

/64/ CADP Group Corp.: Letters to the mayor / vice mayor of La Carlota City to ask permission to present the proposed project at the Sangguniang Panlunsod (SP) session, letter dated 25 June 2008.

/65/ CADP Group Corp.: Summary of minutes Regular Session of Sangguniang Panlunsod, La Carlota City, 16 July 2008.

/66/ Roxas Holding Corporation: Sample invitation letters to the stakeholder consultation meeting (invitation to the public consultation held at Barangay Roberto S. Benedicto, La Carlota City on 20 September 2008), letters dated 5 September 2008.

/67/ CADP Group Corp.: Public Consultation Program, dated 20 September 2008.

/68/ CADP Group Corp.: Attendance list for the public consultation Ethanol Production and Wastewater Methane Capture project, dated 20 September 2008.

/69/ CADP Group Corp.: Summary of minutes, public consultation Barangay RSB, La Carlota City, dated 20 September 2008.

/70/ Richard Bryan C. UY: Expert Verification Interview Summary Report Roxol Bioenergy Corporation Project, dated 9 April 2011.

/71/ Indexmundi: Crude Oil (petroleum) vs Heating Oil – Price Rate of Change Comparison for the period 1997 to 2007.
http://www.indexmundi.com/commodities/?commodity=crude-oil&months=240&commodity=heating-oil

/72/ International Monetary Fund: World Economic Outlook Report April 2012 (page 201) and April 2011 (page 192).

/73/ Bangko Sentral NG Pilipinas: Selected Philippine Economic Indicators April 2012 issue, released on 15 May 2012.
http://www.bsp.gov.ph/statistics/statistics_selected_monthly.asp

/74/ Roxol Bioenergy Corporation: Annex A to a position paper Roxol Bioenergy Corporation (petitioner); Schedule for cost/market values of machinery and equipment, based on KBK invoices, 26 September 2011.

/75/ KBK Chem Engineering Pvt Ltd: Letter on the project progress, dated 9 May 2012.

/76/ Roxol Bioenergy Corporation: Confirmation letter on the project status, reference no EVP-OMS-0712-023, dated 19 July 2012.

/77/ Treasury Department, Bangko Sentral ng Pilipinas: Reference Exchange Rate Bulletin, Cross rates of the peso, value selected for the period 2006.

/78/ National Statistics office of the Philippines: Annual average consumer price index Philippines, for the years 2006-2009.
http://census.gov.ph/data/sectordata/tscpimon.html

/79/ RHI: Confirmation letter for the financial statement audit of Roxol Bioenergy Corporation for crop year 2010-11, dated 11 September 2012.

/80/ GTZ: International fuel prices in 2007, 5th edition, dated April 2007.
https ://www.giz.de/Themen/de/SID-55C98EB9-DB52A783/dokumente/en-international-fuelprices-final2007.pdf (page 67).

/81/ Heavy Fuel Oil Boiler Specification

/82/ Roxol Bioenergy Corporation: Generator logsheets 2012

3.1.2 Letters of approval

/83/ Department of Environment and Natural Resources (DNA of Philippines): Letter of approval dated 23 March 2010

/84/ Ministry of Infrastructure and the Environment (DNA of The Netherlands): Letter of approval dated 20 May 2011

/85/ Ministry of Infrastructure and the Environment (DNA of The Netherlands): Confirmation e-mail from a representative of the DNA about the authenticity of the LOA issued on 20 May 2011, e-mail dated 28 September 2012.

3.1.3 Methodologies, tools and other guidance by the CDM Executive Board

/86/ CDM Executive Board: Validation and Verification Manual, version 1.2

/87/ CDM Executive Board: Baseline and monitoring methodology ACM0014 entitled 'Mitigation of greenhouse gas emissions from treatment of industrial wastewater', version 4.1.0.

/88/ CDM Executive Board: Tool to determine project emissions from flaring gases containing methane, version 1.

/89/ CDM Executive Board: Tool for demonstration and assessment of additionality, version 6.1.0.

/90/ CDM Executive Board: Tool to calculate the emission factor for an electricity system, version 2.2.1.

/91/ CDM Executive Board: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, version 2.

/92/ CDM Executive Board: Tool to determine the remaining lifetime of equipment, version 1 (EB50).

/93/ CDM Executive Board: Guidelines on the assessment of investment analysis, EB62 (Annex 5).

/94/ CDM Executive Board: request for deviation M-DEV0470 entitled "Cogeneration and allocation of emission reductions from biogas", accepted 8 May 2012

/95/ CDM Executive Board: Guidelines on the demonstration and assessment of prior consideration of CDM, version 4 (EB62 Annex 13).

/96/ CDM Executive Board: Glossary of CDM terms, version 6.

3.1.4 Documentation used by DNV to validate / cross-check the information provided by the project participants

/97/ San Carlos renewable energy 8roject:
http://cdm.unfccc.int/Projects/DB/DNV-CUK1171455227.42/view

/98/ DOE Portal, official website of the Philippine Department of Energy: Philippines Power Statistics, not dated. http://www.doe.gov.ph/EP/Powerstat.htm

/99/ Institute for Global Environmental Strategies (IGES): 2006 IPCC Guidelines for National Green House Gas Inventories.

3.2 Follow-up interviews with project stakeholders

On 1-2 March 2010, Kamala Devi Muniandy from DNV visited the Roxol wastewater treatment facility (the project site) in La Carlota and performed interviews with project stakeholders.

	Date	Name	Organization	Topic
/100/	2010-03-01	Ms Julie Godin, Ms Pongtip Puvacharoen	The World Bank	➢ Estimated emission reductions; ➢ Assumptions in baseline determination; ➢ Technology applied and operational lifetime; ➢ Project funding sources.
/101/	2010-03-01	Mr. Jeffrey G. Mijares	Roxol Bioenergy Corporation	➢ Monitoring, reporting and record keeping procedures; ➢ Calibration, internal audit and corrective action procedures; ➢ Compliance with existing environmental regulations; ➢ Stakeholder consultation process; ➢ Provisions for training, operation and maintenance.
/102/	2010-03-02	Ms Joy Gogo	DNA of the Philippines	➢ Philippines's DNA mechanism and criteria for sustainable development; ➢ Letter of approval; ➢ Regulatory framework for solid waste management;

- Stakeholder consultation process;
- Laws and regulations applying to wastewater;
- Similar project activities.

On 7 April 2011, Marlene Fischer and Wong Yon Sing from DNV performed an interview with an independent wastewater expert in accordance with ACM0014 (version 4.1.0) /87/.

	Date	Name	Organization	Topic
/103/	2011-04-07	Richard Bryan C. Uy, MSc	Environmental Engineer	➢ Existing government regulatory standards for effluents of wastewater classified as strong waste discharged; ➢ Wastewater composition from bioethanol plants (input: vinasse / molasses), typical indicators for this kind of wastewater and common treatment methods in the Philippines; ➢ Design specifications of the different lagoon design options; ➢ Cost for the different lagoon design options.

3.3 Resolution of outstanding issues

The objective of this phase of the validation was to resolve any outstanding issues which needed be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a transparent manner the criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

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

The validation protocol consists of four tables. The different columns in these tables are described in the figure below. The completed validation protocol for the project activity "Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant" in Philippines is enclosed in Appendix A to this report.

Table 2 of the validation protocol documents the findings of the desk review of the project design documentation and follow-up interviews with project stakeholders. Any findings raised in Table 2 are listed in Table 3 of the protocol, and changes to the description of the project design as a result of these findings will be addressed in Table 3. Table 2 thus may not reflect all aspects of the project as described in the final PDD submitted for registration.

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

(a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;

(b) The applicable CDM requirements have not been met;

(c) There is a risk that emission reductions cannot be monitored or calculated.

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.

The validation protocol in Appendix A is based on the project design as documented and described in the PDD, version 05 dated 18 January 2011, and Table 3 of the validation protocol will as applicable describe any changes made to this version of the PDD as a result of CARs and CLs raised by DNV. The findings of the validation of the project design as documented and described in earlier version(s) of the PDD are described in the initial validation protocol included in Appendix B to this report.

In total, the validation identified 8 CARs (3 in Appendix A and 5 in Appendix B) and 31 CLs (12 in Appendix A and 19 in Appendix B). The CARs and CLs were satisfactorily addressed by the project participants (refer to the respective table 3 in Appendix A and B for further details). No FAR has been identified during validation.

In addition, DNV would like to mention the fact that the project title has changed over time, in order to make it consistent across all related documents such as PDD, the LoAs, and the MoC. The title of the project in the PDD published for GSC is “Roxol Wastewater Treatment and Methane Gas Recovery Project”, which has been changed to the current title “Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant”.

Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities		
Requirement	***Reference***	***Conclusion***
The requirements the project must meet.	*Gives reference to the legislation or agreement where 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.*

Validation Protocol Table 2: Requirement Checklist				
Checklist question	***Reference***	***Means of verification (MoV)***	***Assessment by DNV***	***Draft and/or Final Conclusion***
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the CDM-PDD	*Gives reference to documents where the answer to the checklist question or item is found.*	*Means of verification (MoV) are **document review (DR)**, **interview (I)** or any other follow-up actions (e.g., on site visit and telephone or email interviews) and **cross-checking (CC)** with available information relating to projects or technologies similar to the proposed CDM project activity under validation.*	*The discussion on how the conclusion is arrived at and the conclusion on the compliance with the checklist question so far.*	*OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements. A **corrective action request (CAR)** is raised when project participants have made mistakes, the CDM requirements have not been met or there is a risk that emission reductions cannot be monitored or calculated. 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)** during validation is raised to highlight issues related to project implementation that require review during the first verification of the project activity.*

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Corrective action and/ or clarification requests	***Ref. to checklist question in table 2***	***Response by project participants***	***Validation conclusion***
*The **CARs** 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 conclusions of the CARs and/or CLs.*

Validation Protocol Table 4: Forward Action Requests		
Forward action request	***Ref. to checklist question in table 2***	***Response by project participants***
The FARs raised in Table 2 are repeated here.	*Reference to the checklist question number in Table 2 where the FAR is explained.*	*Response by project participants on how forward action request will be addressed prior to first verification.*

Figure 1: Validation protocol tables

3.4 Internal quality control

The validation report underwent a technical review performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation team

				Type of involvement						
Role	***Last Name***	***First Name***	***Country***	Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	TA 13.1 competence	Financial expertise
TeamLeader***** (Validator)	Flagstad	Ole Andreas	Norway	✓		✓	✓			
Team leader (Validator)*	Fischer	Marlene	Norway	✓		✓	✓		✓	
Validator**	Wong	Yon Sing	Malaysia	✓		✓	✓		✓	
Validator***	Muniandy	Kamala Devi	Malaysia	✓	✓	✓	✓		✓	
Assessor under training****	Dudek	Agnes	Norway	✓		✓				
Expert	Namboodri	Krishnan	India	✓					✓	
Expert	Khalid	Fathullah Akmal	Malaysia	✓		✓				✓
Technical reviewer	SM Jamaluddin	Wan Hasliza	Malaysia					✓	✓	
Technical reviewer	Lehmann	Michael	Norway					✓		

* Marlene Fischer: Assessor under training (AUT) until January 2011; Team leader from 1 August 2011 to 15 December 2012

** Wong Yon Sing: Team leader from 1 March 2011 to 31 July 2011

*** Kamala Muniandy Devi: CDM Validator and Team leader until 28 February 2011

**** Agnes Dudek: assessor under training from 1 November 2011

***** Ole A. Flagstad: Team leader from 16 December 2012 -

The qualification of each individual validation team member is detailed in Appendix C to this report.

4 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

The final validation findings relate to the project design as documented and described in the PDD, version 13 dated 17 July 2013 /1/.

4.1 Participation requirements

The project participants are the Roxol Bioenergy Corporation / Roxas Holdings, Inc. of the Philippines, The International Bank for Reconstruction and Development (IBRD) as Trustee for the Community Development Carbon Fund (CDCF) as well as the Designated National Authority (DNA) of the Netherlands, the Ministry of Infrastructure and the Environment (IenM). The host Party (Philippines) and the Annex I Party (The Netherlands) meet all relevant participation requirements.

A letter of approval (LoA) was issued by DNA of the Philippines on 23 March 2010 /83/, authorizing Roxol Bioenergy Corporation/ Roxas Holdings Inc. of the Philippines as project participant and confirming that the project assists in achieving sustainable development. The DNA of the Netherlands issued the LoA /84/ on 20 May 2011 and authorized the project participant from the Annex I Party as project participants.

The letters of approval were received from the project participants. The issuance status of the project's letter of approval has been discussed with a representative of the Philippine DNA during the site visit /102/, and an e-mail has been received from a representative of the Dutch DNA /83/. Hence, DNV does not doubt the authenticity of the letter of approval. Moreover, DNV considers that the letters of approval are in accordance with paragraphs 45- 48 of the VVM /86/.

4.2 Project design

The proposed project activity is a Greenfield project developed by the Roxol Bioenergy Corporation Inc. /18/. The project is located in La Carlota City, Province of Negros Occidental in the Philippines. The decimal GPS coordinates of the project are +10.4 latitude and +122.933 longitude as cross-check against Google Earth. It involves the installation of a wastewater treatment facility at an ethanol plant. An anaerobic digester system will be installed at the project site to generate biogas, used for heat and electricity generation. The project will achieve a reduction in greenhouse gas (GHG) emissions by avoiding methane emissions that would have been released in the atmosphere in the baseline (anaerobic open lagoons). The produced steam will displace bunker fuel oil used at the ethanol plant's boiler in absence of this project. The electricity generated from biogas will displace electricity from the Philippines national Luzon-Visayas grid.

In particular, the project involves the installation of two anaerobic digesters with a capacity of 500 m^3/day each resulting in a total wastewater treatment capacity of 1 000 m^3/day /6//57/, one boiler to produce steam with a capacity of 40 tonnes per hour (tph) /8/. The steam output from the boiler will feed a steam turbine for electricity generation with a capacity of 4 MW /12/, and steam extraction capacity of 15-20 tph /12/. The boiler will be fuelled with biogas generated by the anaerobic digester as well as a biomass mix (bagasse and vinasse). In

absence of the CDM project, the ethanol plant would use bunker fuel oil and bagasse as source of fuel for the boiler /81/, while all electricity would be sourced from the grid. Bagasse is a by-product of the ethanol production. However, its production is not continuous and not sufficient to meet the plant energy demand, so that bunker fuel is the main source of fuel in the baseline /5/. The portion of steam produced from biogas and vinasse will displace bunker fuel oil, while the quantity of bagasse available and consumed in the project and baseline scenarios is the same. Conservatively, only the portion of steam and electricity produced from biogas is counted towards emission reduction calculations.

It is anticipated that all biogas is used for electricity and heat generation to meet the plant's energy demand and no export of energy to the grid is foreseen. Any excess biogas during system maintenance of failure will be flared in an open flare system /14/.

The project implements a zero effluent discharge approach /13/, where the sludge resulting from the anaerobic digester will be dried (in an evaporator and dryer) and used as auxiliary fuel for the new steam boiler installed on site. The annual operation of the ethanol plant is estimated to be 300 days /5/.

The project construction started in February 2010, and the commissioning of the wastewater treatment plan took place in June 2011. The treatment plant has not yet commenced its commercial run, and the acceptance and performance test will be undertaken to complete the rectification of the dryer and evaporator sections, which are currently not running on full capacity /76/.

New equipment mainly imported from India will be installed at the project site and the operational lifetime of the project is estimated to be 25 years, as per the supplier's confirmation /31/. This is in line with the default values outlined in option c of the tool to determine the remaining lifetime of equipment (version 1) /92/, specifying the technical lifetime of boilers and steam turbines as 25 years. A 7-year renewable crediting period has been selected for the proposed project activity, starting on 31 December 2012. The project starting date is 27 June 2008, as evidenced through the Annexure to the contract for CADP Group Corp. /7/.

DNV considers the project description of the project contained in the PDD to be complete and accurate. The PDD complies with the relevant forms and guidance for completing the PDD.

4.3 Application of selected baseline and monitoring methodology

The proposed project activity applies the approved consolidated baseline methodology ACM0014 (version 4.1.0) *'Mitigation of greenhouse gas emissions from treatment of industrial wastewater'* /87/ and applicability criteria of this methodology are met as follows:

(i) The project activity aims at reducing methane emissions from industrial wastewater treatment, by installing an anaerobic bio-digester system, as confirmed through the FSR of the project /5/ and the equipment list included in the contract Annexure KBK Chem Engineering Pvt Ltd and Roxol Bioenergy Corporation, dated 27 June 2008 /7/;

(ii) The project activity reflects scenario 1, where in the baseline wastewater is not treated, but directed to open lagoons that have clearly anaerobic conditions. This has been evidenced by the feasibility study report /5/ and the baseline lagoon design report /17/. In the project activity, wastewater is being treated in a new anaerobic digester system and the extracted biogas is used to generate electricity and heat /5/. Excess biogas will be flared /14/. The residual from the anaerobic digester after treatment is treated under

clearly aerobic conditions (dryer and evaporator) and sent back to the process as auxiliary fuel for the boiler /13/;

(iii) A baseline lagoon design report /17/ has been issued for the proposed project activity, identifying 3 lagoon designs option with an average depth of 3.5 m, 5.5 m and 6.5 m respectively. Hence, it is confirmed that the average depth of the open lagoons in the baseline scenario is at least 1m;

(iv) Heat and electricity requirements per unit input of the water treatment facility remain largely unchanged in the baseline scenario and the project activity: whereas no heat or electricity is required for wastewater treatment in the baseline (i.e. open lagoon treatment), the power requirement for the project (i.e. the biogas system and the evaporator and dryer) is 240 kW /9/. This results in less than 1% of overall expected annual average emission reductions /1/;

(v) Data requirements as laid out in this methodology /87/ with regard to the applicability criteria have been verified by DNV during the site visit. Sufficient evidences, as described in the points (i) to (viii), have been provided to substantiate the assumptions made /7//13//14//70//102/ and data requirements are thus deemed fulfilled. In particular, assumptions in the feasibility study report /5/ and the baseline lagoon design report /17/ have been cross-checked during the interview held with an independent wastewater treatment expert /103/;

(vi) The residence time of the organic matter in the open lagoon system should be at least 30 days: the residence time (hydraulic retention time) of the organic matter in the open lagoon system is estimated to be 355 days, as demonstrated in the baseline lagoon design report /17/;

(vii) Local regulations do not prevent the discharge of wastewater in open lagoons, as confirmed by a representative of the Philippine DNA /102/ and the independent wastewater expert /70//103/;

(viii) Inclusion of solid materials in the project activity is not applicable, as solid materials are neither generated by the industrial facility producing the wastewater nor separated from the wastewater stream to be treated separately; the project activity applies a zero discharge policy, where final concentrated spent wash (effluent) is mixed with bagasse and sent to the boiler for incineration /14/. Hence, this criterion is not applicable.

The assessment of the project's compliance with the applicability criteria of ACM0014 (version 4.1.0) /87/ are documented in detail in section B.2 of Table 2 in the validation protocol in Appendix A to this report.

4.4 Project boundary

As per ACM0014 (version 4.1.0) /87/ the spatial extent of the project boundary is the site where the wastewater is treated, including the anaerobic digester, the power and heat generation equipment and the flare installed under the project activity as well as a dewatering system. Since grid electricity is displaced from electricity generation with biogas from an anaerobic digester, the power plants connected to the grid, with the geographical boundary as specified in the latest approved version of the tool to calculate the emission factor for an electricity system /90/ are included in the project boundary.

The emission sources included in the project boundary are as follows:

	GHGs involved	*Description*
Baseline emissions	CH_4	*Emissions from wastewater treatment processes or sludge disposal:* The major source of emissions in the baseline from open lagoons (Scenario 1).
	CO_2	*Emissions from electricity consumption/ generation:* Electricity generation in the grid will be displaced by electricity generated with biogas from an anaerobic digester (the project activity).
	CO_2	*Emissions from thermal energy generation:* Thermal energy is generated with biogas from an anaerobic digester (the project activity) and thus displacing bunker fuels used on site.
Project emissions	CH_4	*Emissions from wastewater or sludge treatment process:* (i) Methane emissions from the lagoons (if effluent from the treatment under the project activity is directed to lagoons): included in case wastewater is stored in the emergency pond. (ii) Physical leakage of methane from the digester system: included. (iii) Methane emissions from flaring (if biogas from the digester is flared): included. (iv) Methane emissions from land application of wastewater/sludge; not included since wastewater and sludge are not applied to land. (v) Methane emissions from wastewater removed in the dewatering process: not applicable to this project.
	CO_2	*Emissions from on-site fossil fuel consumption:* Included, as diesel generators will be used at start-up and during maintenance.
Leakage	None	Not applicable in line with ACM0014 (version 4.1.0).

The identified boundary and selected sources and gases are justified for the project activity. Furthermore, the validation of the project activity did not reveal other greenhouse gas emissions occurring within the proposed CDM project activity boundary as a result of the implementation of the proposed project activity which are expected to contribute more than 1% of the overall expected average annual emission reduction, which are not addressed by ACM0014 (version 4.1.0) /87/.

4.5 Baseline determination

The most plausible baseline scenario of the project activity has been determined in line with ACM0014 (version 4.1.0) /87/ through the following steps:

Step 1: Identification of alternative scenarios

For the treatment of wastewater (W) the following scenarios have been identified:

W1: The use of open lagoons for the treatment of the wastewater: plausible. It has been confirmed with a representative of the DNA during the site visit /102/ and with an independent wastewater expert /70//103/, that open lagoon treatment of wastewater is common practice in the host country;

W2: Direct release of wastewater to a nearby water body: plausible, but not in compliance with regulations in the Philippines. See discussion under step 2;

W3: Aerobic wastewater treatment facilities: aerobic treatment was found not suitable for wastewater with a high organic load /52/ and this alternative is thus eliminated, which is reasonable. It was also confirmed with the independent wastewater expert /70//103/ that aerobic treatment would not be a plausible treatment method for projects with high organic load;

W4: Anaerobic digester with methane recovery and flaring: this alternative is associated with cost for the installation of the methane recovery flaring system whereas no revenues are being generated. As such there are no incentives for the project proponent to implement this alternative, and DNV is of the opinion that it is reasonable to exclude this alternative from further consideration;

W5: Anaerobic digester with methane recovery and utilization for electricity or heat generation by the project developer (the project activity) without being developed as a CDM project: plausible;

W6: Anaerobic digester with methane recovery and production of electricity or heat generation sale to the grid (electricity) or nearby off-takers without being developed as a CDM project: It has been confirmed by DNV during the site visit that there are no potential off-takers of heat/electricity in close proximity of the plant and evidence has been provided accordingly /55/. Furthermore, heat and electricity that is produced by the wastewater treatment system will be used on site and no electricity will be sold to the grid. Thus, this alternative has been excluded from further consideration;

W7: Wastewater is directed to land application without dewatering: plausible, but not in compliance with regulations in the Philippines. See discussion under step 2; and

W8: Wastewater is dewatered and directed to land application/used as fuel in energy applications: plausible, but not in compliance with regulations in the Philippines. See discussion under step 2.

Since the project activity has been implemented as greenfield facility, the specification of scenario W1 has defined the following four steps:

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

   Three baseline lagoon design options have been defined for the project activity taking into consideration local conditions /17/. The annual average temperature on site is 27.4°C, as confirmed through the EIA /57/. The wastewater discharge flow rate is designed to be 1 000 m^3/day /5/, the influent COD is 125 000 mg/L /7/ and a conversion ratio of BOD_5/COD of two (2) has been applied /50/. In compliance with local regulation /21/ the limit for BOD_5 in the final discharge to water bodies of 300 mg/L has been used.

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

A cost comparison for the three baseline lagoon options has been undertaken. For this assessment, land cost of 27.45 PhP/m^2 /33/ and excavation and construction cost of 540.71 PhP/m^2 /34/ both incl. inflation. Operation and maintenance cost, administration cost and sludge disposal cost were not accounted for, as they would be the same for each of the three options. This is deemed reasonable. Total cost of all three options were 199.17 mPhP (option 1), 198.23 mPhP (option 2) and 197.93 mPhP (option 3) /17/, and the lowest cost option, i.e. option 3 with a lagoon depth of 6.5 m was selected as the baseline lagoon design. This is in accordance with ACM0014 (version 4.1.0) /87/.

3. *Verify the average depth of the baseline lagoon design, as determined in Step (b) based on a review of published literature establishing an average lagoon depth for a particular industry (particular type of waste water):*

   It has been demonstrated by adequate literature that the average depth of anaerobic lagoons is in the range of 2.5-7 m /51//53/. Furthermore, it was confirmed during the interview with the independent wastewater expert in the Philippines /70//103/ that the average depth of the lagoon of 6.5 m is reasonable for this particular type of industry, namely wastewater from an ethanol plant with a high organic load.

4. *If the average depth of the lagoon design option identified in Step (b) is deeper than the depth identified through literature review or the control group in Step (c), provide credible explanations why the assumptions of the least cost design are valid:*

   The average depth of the lagoon design option is not deeper than the depth identified through literature review /51//53/ and confirmed by the independent expert in the Philippines /70//103/ and thus, this step is not applicable to the project.

The project activity is implemented as Greenfield facility and hence, DNV has performed an interview with an independent wastewater expert /70//103/ in line with ACM0014 (version 4.1.0) /87/. The basis for discussions was the following documentation, provided to the expert: the PDD /1/, the applicable baseline methodology ACM0014 (version 4.1.0) /87/, the feasibility study report /5/, the lagoon design baseline report /17/ and the environmental impact assessment /57/. During the interview, DNV was able to confirm that the least cost lagoon design has been selected, that defined design parameters are reasonable and that the selected baseline for the project activity, i.e. the treatment of effluent in anaerobic lagoons, is feasible taking into consideration the characteristics of the wastewater resulting from this type of industry. An official statement has been issued by the expert, confirming the results based on literature review /70/.

For the treatment of sludge (S) no scenarios have been identified:

The project does not fall under Scenario 2 as defined in ACM0014 (version 4.1.0) /87/ and hence no alternative scenarios for the treatment of sludge (S) are defined. This has been confirmed during the site visit and is deemed reasonable.

For electricity generation (E) the following scenarios have been identified:

E1: Power generation using fossil fuels in a captive power plant: Installing a new captive power plant would not be appealing to the project proponent because electricity is easily available from the grid, without any additional investment and O&M costs associated with the implementation of such a plant. Taking into consideration fossil fuel prices in the Philippines, which show an increasing trend over the recent years

from 29.28 PhP/l in 2009 to 44.41 PhP/l in 2011 (on average) /38/, and the average amount of fossil fuel needed in a diesel generator to generate 1 kWh of electricity /40/, the price to generate 1 kWh of electricity was found to be between 0.23 USD/kWh and 0.33 USD/kWh /38//40/. Comparing this value to the electricity tariff of 0.08 USD/kWh /36/ used in the financial analysis of the project /3/, with tariffs remaining stable in the last years as shown on the webpage of the Philippine Department of Energy /36/, it is demonstrated that electricity generation using fossil fuels in a captive power plant would be more costly than deriving electricity from the grid. Thus, this alternative can be excluded from further consideration; not plausible;

E2: Electricity generation in the grid: plausible;

E3: Electricity generation using renewable sources: the sugar cane harvest season commences from October to December and usually ends in May; moreover, *'the Philippine window for cane ripening appears to be limited by a dry period of 120 to 150 days'* /43/. Since biomass such as sugarcane is not available year around, electricity generation cannot rely solely on renewable energy such as biomass.

Using other renewable energy sources, i.e. wind or photovoltaic, would require substantial investment in order to meet the energy demand of the plant; investing in these type of energy sources would furthermore be against the company's core business, which is the production of ethanol and thus, this alternative is eliminated; not plausible;

E4: Electricity generation using a combination of grid electricity and renewable energy sources: as explained in E3, the sugar cane harvest season commences from October to December and usually ends in May; moreover, *'the Philippine window for cane ripening appears to be limited by a dry period of 120 to 150 days'* /43/. Since biomass such as sugarcane is not available year around, electricity generation cannot rely on renewable energy such as biomass. In addition, it would cost less to import grid electricity than investing in a renewable plant facility while mixing the electricity source from the grid.

Using other renewable energy sources, i.e. wind or photovoltaic, would require substantial investment in order to meet the energy demand of the plant; investing in these type of energy sources would furthermore not be in line with the company's core business, which is the production of ethanol and thus, this alternative is eliminated; not plausible;

E5: Electricity generation using a combination of renewable energy sources and biogas undertaken without being developed as a CDM Project; this option is technically plausible but the feasibility of this option will be demonstrated via investment analysis;

For heat generation with biogas from a new anaerobic digester (H) the following scenarios have been identified:

H1: Co-generation of heat using fossil fuels in a captive cogeneration power plant: it has been confirmed that there is a lack of co-generation track record in the Philippines /44/ faces barriers due to limited availability of technology and lack of experience by local equipment supplier /44/. Furthermore, the co-generation of fossil fuel is hampered by the prices for diesel in the Philippines, which show an increasing trend over the recent

years from 29.28 PhP/l in 2009 to 44.41 PhP/l in 2011 (on average) /38/. The project activity applies the use of a dual boiler able to burn more than one type of fuel and does not imply the implementation of a co-generation plant. Given the limited availability of the technology /44/, lack of concrete incentives for investors and limited access to financing, scenario H1 (Co-generation of heat using fossil fuels in a captive cogeneration power plant) is not plausible. Hence, this alternative is excluded from further consideration which is deemed reasonable; not plausible;

H2: Heat generation using fossil fuels in a boiler: plausible; It is confirmed by the FSR /5/ that bunker fuel oil would be the main source of fuel in absence of the project. Although bunker fuel oil is the primary fuel used for heat generation by ethanol production facilities in the Philippines, however the common practice is to use fuel oil in combination with bagasse (a residue from the ethanol industry) for heat generation. If not burn at the facility, most ethanol producers will struggle to dispose bagasse excess. DNV has verified that a typical fossil fuel boiler use bagasse as auxiliary source of fuel /81/. Bagasse is thus considered as supplementary fuel to fossil fuel. Therefore, although this scenario is plausible, it is neither the common practice nor a profitable option for sugarcane plants;

H3: Heat generation using renewable sources: DNV verified that the sugar cane harvest season commences from October to December and usually ends in May; moreover, as confirmed through the study prepared for the Food and Agriculture Organization of the United Nations, *'the Philippine window for cane ripening appears to be limited by a dry period of 120 to 150 days'* /43/. By demonstrating that the supply of biomass such as sugarcane is seasonal and not available year around, heat generation cannot rely solely on renewable energy such as biomass, but would require the use of additional fuel sources. Bagasse is a by-product of ethanol production, and can be used as supplementary fuel when available. DNV has verified that a typical fossil fuel boiler use bagasse as auxiliary source of fuel /81/. Bagasse is thus considered as supplementary fuel to fossil fuel (H2) or biogas (H5) for steam generation. It should be noted that bagasse (a by-product of the sugar industry) is used under both (1) Baseline scenario: the bagasse is burnt in the steam boiler, together with fuel oil, to generate just steam (not electricity) and, (2) Project scenario: the bagasse is burnt in the steam boiler together with vinasse and biogas to generate steam as well as electricity. Therefore, given that the supply of renewable energy sources such as biomass (scenario H3) is not readily available for heat production and that the amount of bagasse burnt is the same in the baseline as it is in the proposed project activity, scenario H3 is not plausible;

H4: Heat generation using a combination of fuel types: including renewable sources: as explained in H3, sugar cane harvest season commences from October to December and usually ends in May; moreover, as confirmed through the study prepared for the Food and Agriculture Organization of the United Nations, *'the Philippine window for cane ripening appears to be limited by a dry period of 120 to 150 days'* /43/. By demonstrating that the supply of biomass such as sugarcane is seasonal and not available year around, heat generation cannot rely solely on renewable energy such as biomass, but would require the use of additional fuel sources. Bagasse is a by-product of ethanol production, and can be used as supplementary fuel when available. DNV has verified that a typical fossil fuel boiler use bagasse as auxiliary source of fuel /81/.

Bagasse is thus considered as supplementary fuel to fossil fuel (H2) for steam generation and is a common practice for ethanol production facilities; plausible;

H5: Heat generation using a combination of fuel types: renewable sources and biogas undertaken without being developed as a CDM Project; this option is technically plausible but the feasibility of this option will be demonstrated via investment analysis;

For the treatment of solid materials (SM) no scenarios have been identified:

No solid materials are generated in the baseline and/or project activity and hence no alternative scenarios are defined. This has been confirmed during the site visit and is deemed reasonable.

Equivalent to sub-step 1a of the tool for the demonstration and assessment of additionality /89/ and ACM0014 (version 4.1.0) /87/, the remaining realistic and credible alternatives can be combined as follows:

1: W1 + E2 + H4)	5: W5 + E5 + H5
2: W2 + E2 + H4	6: W5 + E5 + H4
3: W5 + E2 + H4	7: W7 + E2 + H2
4: W5 + E2 + H5	8: W8 + E2 + H2

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

In line with sub-step 1b of the tool for the demonstration and assessment of additionality /89/, the alternatives which are prohibited by applicable laws and regulations are as follows:

W2: Direct release of wastewater to a nearby water body, prohibited by the Philippine Clean Water Act of 2004, in particular chapter 5 section 27 (a) of 'Prohibited Acts' /19/;

W7: Wastewater is directed to land application without dewatering; and

W8: Wastewater is dewatered and directed to land application/used as fuel in energy applications.

Local regulations in the host country mandate wastewater to be treated before being discharged, this was verified by DNV through the review of the Philippine Clean Water Act of 2004, in particular chapter 5 section 27 (a) of 'Prohibited Acts' /19/.

The other remaining alternatives, for wastewater treatment (W1, W5), electricity generation (E2, E4) and heat generation (H2+H3, H4+H3) are not prevented by applicable laws and regulations in the Philippines and hence the following alternative combinations remain:

1: W1 + E2 + H4	4: W5 + E2 + H5
3: W5 + E2 + H4	5: W5 + E5 + H5

Step 3: Eliminate alternatives that face prohibitive barriers

Alternatives that face prohibitive barriers have been eliminated in the abovementioned steps. Furthermore, since the project is the simultaneous production of electricity and heat, combinations 3 and 4 are excluded from further consideration. The following combined alternatives remain:

1: W1 + E2 + H4	5: W5 + E5 + H5

Step 4: Compare economic attractiveness of remaining alternatives

The economic attractiveness of the remaining alternatives (W1 + E2 + H4) and (W5 + E5 + H5) has been compared by applying an investment comparison analysis. For details cf. section 4.6 Additionality of this report, where it is shown that the more cost effective scenario is W1 + E2 + H4, resulting in a NPV before tax (-3 319 043 USD) as compared to the alternative W5 + E5 + H5 with a NPV of (- 4 100 022 USD).

Conclusion:

Based on the assessment in step 1 to 4 above, DNV is of the opinion that the baseline for the project activity has been correctly defined as the combination of the use of open lagoons for the treatment of the wastewater (W1), electricity generation in the grid (E2) and heat generation using a combination of fuel types: including renewable sources (H4). The selected methodology ACM0014 (version 4.1.0) /87/ is thus applicable.

The approved baseline methodology has been correctly applied to identify a complete list of realistic and credible baseline scenarios, and the identified baseline scenario most reasonably represents what would occur in the absence of the proposed CDM project activity.

All the assumption and data used by the project participants are listed in the PDD and/or supporting documents. All documentation relevant for establishing the baseline scenario are correctly quoted and interpreted in the PDD. Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD.

4.6 Additionality

Additionality is addressed through the tool for the demonstration and assessment of additionality (version 6.1.0) /89/.

4.6.1 Evidence for prior CDM consideration and continuous actions to secure CDM status

The starting date of the proposed project activity is 27 June 2008, which is the date of the order agreement for the plant and project equipment, evidenced by the contract annexure for CADP Group Corp. /7/. The contract issued by KBK includes the supply for fabrication, manufacture, supervision of installation and commissioning of the complete biogas plant and evaporation section /7/; DNV furthermore verified the turbine proposal, issued by KBK on 30 July 2008 /12/, representing the major equipment to be installed in the context of the project. Based on the evidence provided and sectoral knowledge, DNV is of the opinion that the project starting date represents the first commitment to expenditure and is in accordance with the glossary of CDM terms /96/. Hence, the project starting date is adequate in the context of the project.

The starting date is before the 2 August 2008 and thus the project participant did not inform the Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and their intention to seek CDM status.

Prior consideration of CDM:

A secretary's certificate issued by the Assistant Corporate Secretary of Roxas Holding Inc. has been received /25/ to confirm that regular board meetings were held on 8 December 2005 and 27 September 2006, where the corporation was notified of the proposed CDM project.

A project idea note (PIN) was submitted to the World Bank on 21 March 2007 /23/ and further evidence for prior consideration of CDM has been provided in form of an e-mail conversation between the project participant and the World Bank about the letter of intent /24/, dated 1 May 2007. A request for revision of the approved consolidated baseline methodology ACM0014 (AM_REV_0078) to include Greenfield projects has been submitted to the secretariat on 12 January 2008 /28/.

A board meeting with members from the Roxas Holdings Inc. (RHI) and CADP Group Corp. (CADPGC) was held on the 15 November 2007 to discuss the ethanol project of the Roxas Group and the proposed financing of the project. Extracts of the original minutes of meeting were provided by the project participant /26/. Furthermore, an official statement of a representative of the RHI has been received, confirming that the board during this meeting decided 'to implement the proposed ethanol project of the group including the CDM project activity' /27/.

Based on the presented timeline and verifying the aforesaid supporting documents, DNV confirms that CDM has been a decisive factor in the decision to proceed with the implementation of the proposed project activity.

Continuous action to secure CDM status:

A letter of intention to seek CDM status for the proposed project activity has been submitted to the UNFCCC by the project participant on 15 September 2008 /29/. The project participants signed an ERPA for the project activity on 14 January 2009 /22/. Furthermore, the contract with the validating DOE was signed in December 2009 and the PDD was web-hosted for GSC in February 2010 /30/. Since then, validation activities have been on-going (refer Appendix A of this report).

It is DNV's opinion that the proposed CDM project activity complies with the requirements of the latest version of the Guidelines on the demonstration and assessment of prior consideration of CDM /95/.

4.6.2 Identification of alternatives to the project activity

For a detailed discussion of alternatives to the project activity refer to section 4.5 Baseline determination. DNV considers the listed alternatives to be credible and complete.

4.6.3 Investment analysis

Choice of approach

Investment comparison analysis (Option II) has been selected to demonstrate the additionality of the project. This is deemed reasonable, since at least two alternative combinations have been identified (cf. section 4.5 Baseline determination) which require investment. The choice of approach is deemed reasonable and in accordance with the latest tool for the demonstration and assessment of additionality /89/.

Discount rate selection

The selected discount rate for the project is 12% (before tax), derived from the Power Supply Plan for the Philippine national grid (based on vintage data / estimates for the period 2004 to 2013) published on the official webpage of the Philippine Department of Energy /45/.

The latest EB Guidelines on the assessment of investment analysis /93/ defines a discount rate of 12.75% in the Philippines for Group 1, relevant for projects in the energy industries (scope

1) and waste handling and disposal (scope 13). The applied discount rate of the project of 12% is before tax /45/ and hence more conservative compared to the discount rate presented in the respective EB guidance /93/.

Moreover, DNV compared the discount rate selected for the project with other discount rates for projects registered under the CDM under the applied methodology ACM0014, as presented in the following table. It is to be noted that from the 8 projects registered under the CDM, none is located in the Philippines.

Project ref. (ACM0014)	*Host country*	*Discount rate / benchmark*
5518	Thailand	15%
5364	Vietnam	10%
4678	Indonesia	12.96%
4291	Vietnam	13%
4265	Indonesia	6.65%
3759	China	12%
3686	Malaysia	12%
2970	Thailand	15.82%
Average		***12.18%***
The project activity	Philippines	12%

The comparison of discount rates used for other projects show that the average benchmark for project located in South East Asia is 12.18% which is slightly higher than the discount rate of 12% used for the proposed project activity. In conclusion, DNV is of the opinion that the benchmark is suitable in the context of the project.

Input parameters

Investment comparison analysis (Option II of the tool for the demonstration and assessment of additionality /89/) has been selected to determine whether the project activity is not the most economical or financial feasible alternative. The NPV for the two remaining alternatives (W1 + E2 + H4) and (W5 + E5 + H5) has been calculated.

Assessment period:

The assessment period to calculate the net present value (NPV) is 25 years, equal to the lifetime of equipment as confirmed through a letter issued by the equipment supplier /31/. The technical lifetime is in accordance with the default values outlined in option c of the tool to determine the remaining lifetime of equipment (version 1) /92/, specifying the technical lifetime of boilers and steam turbines as 25 years. DNV is thus of the opinion that the assessment period has been selected in accordance with the Guidelines on the assessment of investment analysis /93/.

Time of investment decision:

In accordance with paragraph 6 of the Guidelines on the assessment of investment analysis, input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by the project participant. The time of investment decision was taken during a board meeting held on 15 November 2007 /26/.

Exchange rate:

The exchange rate for US dollars (USD) and Philippine Pesos (PHP) of 51.31 PhP/USD is derived from the Exchange Rate Bulletin of the Central Bank of Philippines /77/. The value has been selected for the year 2006, as the latest value available at the time of investment decision in November 2007.

Land price:

The land price of 20 000 USD/ha has been sourced from feasibility study report (FSR) of the proposed project activity issued in July 2007 /5/. The land area needed for the project activity has been estimated from plant layout drawings dated September 2007 /6/. . The time period between FSR and the investment decision is 5 month. Considering this short period of time, DNV is of the opinion that the input parameter would not have significantly changed and is thus reasonable in the context of the project.

Alternative 1: Anaerobic digester with methane recovery and utilization for electricity or heat generation and electricity and heat being generated with biogas, bagasse and vinasse (W5, E5, H5) – NPV of minus 4 224 007.

Project cost

a) *Investment cost:* Total investment cost mount up to 10 068 661 USD and are mainly sourced from the feasibility study report (FSR) of the proposed project activity issued in July 2007 /5/. The FSR include on page 10 an overview of the cost for the complete ethanol plant, while on page 37 the specific costs for the waste water treatment are provided. In the validation report version 01, all costs were sourced from the summary page 10. However, the costs for the biogas digester, evaporator and condensate treatment system, previously sourced from page 10, are now sourced from page 37 as this reflect more precisely the equipment implemented for the project. Additionally, some costs identified in the FSR, which were conservatively not considered in the previous investment analysis (i.e. boiler, water treatment, laboratory, and civil costs) have now been added in order to reflect more precisely the project cost. In summary, the project costs as stated in the FSR (page 37) include expenses for the anaerobic digester system (1 948 775 USD), the vinasse evaporator and condensate treatment system (2 241 091 USD), the paddle mixer and dryer (487 194 USD) and the turbine (1 728 000 USD) /5/. The cost of the emergency pond is 4 215 USD, evidenced by a purchase order for construction of a similar type of lagoon by the project developer /34/ and the technical specification of the emergency lagoon /60/. Based on these two evidences, the price of the emergency pond in PhP/m^3 is calculated for 2009 (610.11 PhP/m^3), and adjusted for the inflation rate to match the time of investment decision in November 2007 (540.71 PhP/m^3), which is conservative. The site development costs of 24 500 USD are calculated by the required area for the WWT plant (0.98 ha) as per the KBK plant layout /6/ and the estimated cost for the site development (25 000 USD/ha) as stated in the FSR /5/.

Costs for the boiler and water treatment system for the boiler water are also sourced from the FSR /5/. Since bagasse would also be used in the absence of the project, only 60% of the boiler costs (1 431 600 USD) and water treatment costs (243 000 USD) are considered in the investment cost. This ratio correspond to the portion of the energy consumed used for electricity generation. The remaining boiler cost (40%) corresponds to the steam delivered to the plant which is equal in both projects and baseline scenario. This is not considered in the financial analysis neither for the baseline nor the project scenario. DNV consider that the higher cost for the project boiler than the baseline boiler and the assumption to consider 60% of the boiler and water treatment costs are reasonable and justified since:

- The project boiler has a higher capacity
- The project boiler is of more advance technology since burning vinasse is not common practice in the Philippines.

The above approximation was necessary as the FSR did not evaluate the costs of the baseline scenario.

It should also be noted that the project scenario is still less attractive than the baseline when the portion of the boiler cost additional to the baseline cost decrease to 35% (or in other words if the project boiler is approximately assumed be only 50% more expensive than the type of boiler needed in the absence).

Other costs related to the project are also sourced from the FSR (cooling tower, laboratory, and conservatively only 10% of the civil work and support facilities estimated for the whole plant). Further, as per FSR, 10% contingencies cost are considered /5/.

Furthermore, DNV cross-checked the actual investment cost through the review of the Annex A schedule, referring to invoices issued for the project activity mainly by KBK, in particular for the biogas anaerobic digester system, vinasse evaporator, paddle mixer and dryer, as well as condensate treatment system costs. The document is part of a position paper between Roxol Bioenergy Corporation and the government /74/. The equipment already contracted represents about 71% of total investment cost of the financial analysis. Furthermore, DNV verified that the actual costs for the aforesaid equipment are only 3% lower than the equivalent estimated in the FSR. Hence, it is DNV's opinion that the costs estimated in the FSR are reasonable.

b) Annual O&M cost: O&M cost are 696 033 USD/year and include (i) direct labour cost, (ii) fuel cost for the wastewater treatment plant, (iii) maintenance cost, (iv) administrative and insurance cost. These cost have been verified as follows:

(i) *Direct labour cost* of 28 627 USD/year included in the investment analysis /3/ are calculated from monthly salaries referred to in the FSR /5/, in particular 25 000 PhP for supervision, 30 000 PhP for wastewater treatment plant operation, 10 000 PhP for the laboratory analyst, 10 000 PhP biogas/bagasse feeding tender to the boiler, 20 000 PhP for electrical engineers for the biogas system and turbine and 18 000 PhP for helpers /5/.

(ii) *Fuel cost* for the WWT plant are 5 798 USD/year, estimated based on the mechanical equipment of the plant as confirmed with the contract annexure /8/, the IPCC default upper limit of uncertainty at a 95% confidence internal of 43.3 GJ/t is selected for the

NCV of diesel; operational hours have been estimated by the project participant based on the assumptions that the power plant is operational 300 days/year /57/. The diesel price is 0.67 USD/l derived from the GTZ report on international fuel prices in 2007 /80/.

(iii) *Annual maintenance costs* are estimated to be 237 320 USD, i.e. 4% of total capital cost derived from the FSR /5/. Based on DNV's sectoral competence this is deemed reasonable.

(iv) *Chemicals costs* related to the project are conservatively estimated as 10% of the total chemical consumption of the plant provided in the FSR /5/. This correspond to 16 370 USD/year, and considered to be reasonable by DNV.

(v) *Administrative and insurance costs* are estimated to be 257 238 USD/year. Assuming that the WWT plant investment cost (USD 5 954 715) represent around 22% of the total investment cost of the ethanol plant (USD 27 094 000) as per the FSR /5/, it can be assumed that 22% of the 60 mPhP fixed operating cost (i.e. administrative and insurance cost) correspond to the WWT facility /5/. This means that approximately 13.2 mPhP (out of 60 mPhP) are spent in administrative/insurance activities of the WWT plant.

DNV cross-checked the estimates in the financial analysis against a letter provided by Roxas Holdings Inc. (RHI) /79/, the holding company of Roxol Bioenergy Corporation, confirming that based on an audited financial statement of Roxol Bioenergy Corporation for the year 2010-11 actual administrative and insurance cost amounted 15.689 mPhP, and are thus higher than the estimates in the financial analysis. Hence, DNV is of the opinion that assumptions made are conservative.

(vi) *Vinasse concentration costs* of 5 000 000 PhP/y (97 439 USD/y) have been sourced from FSR /5/, and correspond to the preparation of vinasse slops.

(vii) Combustion costs of 1 640 000 PhP/y (31 960 USD/y) have been sourced from FSR /5/, and correspond to the cost for mixing bagasse and vinasse.

Project revenues

a) Residual value: A residual value of 1 569 575 USD has been included as income in the last year of the financial analysis /3/. This value is calculated as the sum of the residual value of the land (5 000 USD) and the residual value of the wastewater treatment and utilization system (1 564 575 USD), adjusted to the inflation rate for 2007.

The Philippine tax code in section (F) Depreciation /47/ does not prescribe a specific depreciation rate and hence a rate of 5% (usually applied for buildings) is used in the financial analysis to calculate the residual value for the proposed project activity. This value is derived from the IMF working paper /48/ where it is mentioned that *'since the depreciation method and allowance for the Philippines is not specified, we assume that firms select the straight-line balance method at 5 percent for buildings, and the declining-balance method at 25 percent for plant and machinery, in line with regional practice'* /48/; the report has been issued in September 2008, and uses data sources from 2004

onwards. Applying the 5% depreciation instead of the 25% (usually used for plant and machinery) is more conservative, as the rate of 25% would lead to a NPV of minus 6 810 224 /3/.

It has been confirmed by KBK Chem-Engineering /31/ that the digester plant has a lifetime of up to 25 years, if proper maintenance is done. The technical lifetime of the equipment is equal to the assessment period of financial analysis /3/, in line with the default values outlined in option c of the tool to determine the remaining lifetime of equipment /92/ specifying the technical lifetime of boilers and steam turbines of 25 years.

b) Annual revenues from electricity saving: Revenues from electricity savings are calculated by multiplying (i) the annual electricity production from biogas, bagasse and vinasse with (ii) the price of electricity in 2007 and mount up to 1 132 053 USD/year /3/. These cost have been verified as follows:

(i) Net electricity production (14 908 000 MWh) is estimated based on the power requirements of the plant (2.8 MW) /9/ and 300 operating days in the year /5/. Note that in the FSR /5/, ethanol plant electricity consumption was estimated at 2.1 MW. Furthermore, the maximum power demand in 2012 was 2.04MW /82/, thus the value of 2.8 MW used in the financial analysis is verified to be conservative.

(ii) The average price of electricity in 2007 is 3.90 PhP/kWh (rounded) or, as stated in the financial analysis /3/, 0.08 USD (with an exchange rate of 51.31 PhP/USD) as confirmed against the homepage of the National Power Corporation /36/.

c) Annual revenues from bunker fuel oil saving: Revenues from heat production savings are calculated by multiplying (i) the price of fossil fuel with (ii) the quantity of bunker fuel avoided and taking into consideration (iii) the density of fossil fuel, and savings mount up to 231 933 USD/year.

(i) The quantity of bunker fuel oil avoided (480.2 t/y) is based on the annual heat production from biogas and vinasse (194 TJ) as described in section 4.8 Emission reductions of this report (in section 4.8 the heat production for biogas (31.34%) only is calculated, resulting in 101 TJ. The portion of heat from vinasse represent 29.08%, thus the combined heat from biogas and vinasse (60.42%) is calcularted as 0.6042 [(360 000 kg/d*300d/y) * 3 238.9 kJ/kg]- [210 000 kg/d *300 d/y * 100 ^{o}C * 4.1868 kJ/kg C] / 10E9 = 194 TJ/y); and the NCV of 40.4 TJ/Gg selected in accordance with the IPCC 2006 Guidelines, volume 2, chapter 1, table 1.2 /99/.

(ii) The price of bunker fuel oil is calculated as 23.62 PhP/l, derived from the price of bunker fuel oil of 22.97 PhP/l /39/, being adjusted using the average inflation rate in the Philippines in the year 2006 (CPI 137.9) and 2007 (CPI 141.8) /42/. With the exchange rate of 51.31 PhP/USD /77/, the price of bunker fuel oil, as stated in the financial analysis, is 0.46 USD/L.

(iii) The density of bunker fuel oil is 0.95 kg/L, in accordance with marketing specifications for shell fuel oil Philippines /39/.

Alternative 2: The use of open lagoons for the treatment of the wastewater, electricity generation in the grid and heat generation using fossil fuels and bagasse in a boiler (W1, E2, H4) – NPV of minus 3 319 043

Project cost

a) *Investment cost:* Total investment cost mount up to 3 718 449 USD and these costs are calculated based on the lagoon design baseline report /16/, where cost for the open lagoon treatment system (option 3) are 197.93 million Philippine Pesos (mPhP); the applied exchange rate is 51.31 PhP/USD.

b) *Direct operating cost:* Annual direct operating costs are calculated to be 100 USD. These costs include the sludge disposal from the baseline lagoon, which has been estimated based on a purchase order for dump truck rental (2 units) /35/ and an estimated usage of trucks of 3 days per year /3/.

Calculation and conclusion

The calculation spreadsheet /3/, presenting the NPV for the two remaining alternatives, has been received, verified and found to be correct by DNV. The assumptions that form the basis for the calculations are found to be reasonable and based on its sectoral competence DNV is of the opinion that adequate at the time of the investment decision (15 November 2007) /26/.

It has been presented that the combination W5 + E5 + H5 with a NPV of minus 4 224 007 is financially less attractive than the combination W1 + E2 + H4 with a NPV of minus 3 319 043. Therefore, the project is additional.

Sensitivity analysis

A sensitivity analysis has been undertaken, varying relevant parameters of each remaining scenario to the point when the NPV of the compared baseline scenario is reached.

Scenario W5 + E5 + H5

- Bunker fuel avoided: The NPV of the project would reach the baseline NPV when the bunker fuel avoided increases by 50%. This is not possible to happen in the future since all available biogas for the project activity was taken into account in the NPV calculations.
- Electricity production from biogas: The NPV of the project would reach the baseline NPV when the electricity production increases by 11%. This is not possible to happen in the future since all available biogas for the project activity was taken into account in the IRR calculations.
- Bunker fuel tariff: The NPV of the project would reach the baseline NPV when the bunker fuel tariff increases by 50%. DNV has verified the historical variation of bunker fuel oil tariff for heating oil price, which is similar to bunker fuel oil and heavy fuel oil, for the period 1997 to 2007 /71/. The evidence reviewed /71/ show a variation of 15.73% for heating oil price from 1997 to 2007, thus it is unlikely that the bunker fuel tariff will increase by 50% during the project lifetime.
- Electricity tariff: The NPV of the project would reach the baseline NPV when the electricity tariff increases by 11%. DNV has verified the historical variation of the electricity tariff for the Luzon grid covering the period 2005 to 2008 (the latest information available at the time of the project activity investment decision) through the review of published data by the National Power Corporation /36/. Based on the information reviewed, DNV confirms that the average tariff have remained constant from 2005 to 2008. Thus it is unlikely that the electricity tariff will increase by 11% in the future.

- Investment cost: The IRR would reach the benchmark if the investment cost decreases by 10%. DNV has verified the actual investment cost through the review of the Annex A schedule, referring to invoices issued for the project activity mainly by KBK, in particular for the biogas anaerobic digester system, vinasse evaporator, paddle mixer and dryer, as well as condensate treatment system costs /74/. The equipment already contracted represents about 71% of total investment cost. Furthermore, DNV verified that the actual costs for the aforesaid equipment are about 3% lower than the equivalent estimated in the FSR. Thus, it is unlikely that the investment cost will decrease by 10% in the future.
- O&M cost: The IRR would reach the benchmark if the investment cost decreases by 17%. These costs are covering direct labor, fuel costs, maintenance, material fee, administrative costs and insurance. These costs are unlikely to decrease by 20% since the material price and wages for the workers have been increasing due to the inflation rates in Philippines: the average inflation rate was 5.1% for the period 2003-2007 (just before the investment decision was made) and 5.2% for the period 2008-2011 /72/. Therefore, it is highly unlikely that the O&M cost of the proposed project will be reduced by 17%.

Scenario W1 + E2 + H4

- Capital cost: The capital cost of the project activity would need to increase by 100% to reach the project NPV. The excavation and land cost are the main components under the capital costs. DNV has verified that the land cost incurred prior the project starting date as verified with the signed contract for land purchased /33/. With regards to the excavation costs, these are unlikely to increase by 100%, DNV has verified that in the Philippines annual percentage change in wage rates (2%) for the period 2003 to 2007and services inflation rates (7.66%) for the period from 2008 to 2012 as verified by through statistical data from the Central Bank of the Philippines /73/.
- O&M cost: The O&M costs are negligible since an increase by 10 000% would have no effect on the baseline NPV value (from 3 319 043 to 3 388 365).

The sensitive analysis shows that the key parameters been varied to reach the benchmark and the likelihood of this to happen been justified to be small. In conclusion, the investment analysis and sensitivity assessment have shown that the project activity is not financially attractive.

4.6.4 Barrier analysis

Not applicable.

4.6.5 Common practice analysis

The common practise analysis has been undertaken in line with the tool for the demonstration and assessment of additionality (version 6.1.0) /89/. In accordance with the tool, the project falls under the measure c) methane destruction. Common practice analysis is discussed as per the following steps:

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

The wastewater treatment plant is designed to treat 1 000 m^3 of wastewater per day, as confirmed against the feasibility study report /5/. Hence, the applicable capacity of similar projects, i.e. ethanol wastewater treatment plants, is 500-1 500 m^3.

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.

The applicable geographical area is the Philippines. There are two bioethanol producers accredited by the Philippine Department of Energy as of 17 August 2009 /62/, namely Leyte Agri Corporation and San Carlos Bioenergy Inc. The ethanol plant operated by Leyte Agri Corporation is using is a stabilizer where wastewater (slops) is treated in a collecting pond. This has been confirmed through an e-mail received from Leyte Agri Corporation /56/. San Carlos has been registered as CDM project on 13 April 2007 (UNFCCC ref. nr. 0931) /63/ and is thus excluded from further consideration.

As a result, there is only one other ethanol plant in the Philippines that has to be considered under the common practice analysis and $N_{all} = 1$.

Step 3: Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity.

The existing ethanol plant in the Philippines uses a different technology based on a stabilizer where the wastewater is treated in collecting pond /56/. Thus, $N_{diff} = 1$.

Step 4: Calculate Factor: $F = 1 - N_{diff}/N_{all}$

F = 0 and it is thus sufficiently demonstrated that the proposed project activity is not common practise in the host country.

4.7 Monitoring

The project monitoring plan is in compliance with the monitoring methodology ACM0014 (version 4.1.0) /87/. The project proponent furthermore provided detailed monitoring arrangements in the revised PDD /1/ in response to the findings in table 3, Appendix A and B of this report. Hence, it is DNV's opinion, that the project participant is able to implement the monitoring plan.

4.7.1 Parameters determined ex-ante

The following parameters were determined *ex-ante* and are available at validation:

- COD of the effluent in the period x ($COD_{out,x}$): 180 tCOD/yr (calculated /7//54/);
- COD directed to the open lagoons in the period x ($COD_{in,x}$): 37 500 tCOD/yr (calculated /7/);
- Maximum methane producing capacity (Bo): 0.21 tCH_4/tCOD /99/;
- Factor expressing the influence of the lagoon depth on CH_4 generation (f_d): 70% for an average depth of > 5m /87/;
- Average depth of lagoon (D): 6.5 m /17/;
- Annual quantity of electricity that would be consumed in the absence of the project activity for the treatment of the wastewater (EC_{BL}): 0 MWh/yr /87/;
- Grid emission factor ($EF_{grid,y}$): 0.5416 t CO_2/MWh /98/;

- CO_2 emission factor of the fossil fuel type used in the boiler for heat generation in the absence of the project activity ($EF_{CO2,FF,boiler}$): 72.60 t CO_2/TJ /99/;
- Efficiency of the boiler that would be used for heat generation in the absence of the project activity ($\eta_{EL,boiler}$): 89.8% /8/;
- Fraction of biogas that leaks from the digester ($FL_{biogas,digest,y}$): 0.05 m^3 biogas leaked/m^3 biogas produced /99/;
- Global warming potential for CH_4 (GWP_{CH4}): 21 tCO_2e/tCH_4 /87/;
- Surface of the lagoon or sludge pit (A): 5.39 ha /17/,
- Molecular mass of methane (MM_{CH4}): 16.04 kg/kmol /88/;
- Molecular mass of nitrogen (MM_{N2O}): 28.02 kg/kmol /88/;
- Methane density at normal conditions ($\rho_{CH4,n}$): 0.0007168 tCH_4/m^3CH_4 /88/;
- Atmospheric pressure at normal conditions (P_n): 101 325 Pa /88/;
- Universal ideal gas constant (R_u): 8 314.472 $Pa.m^3$/kmol.k /88/;
- Temperature at normal conditions (T_n): 273.15 K /88/.

4.7.2 Parameters monitored ex-post

The following parameters will be monitored ex-post:

- Quantity of wastewater that is treated in the anaerobic digester ($F_{PJ,dig,m}$): measured continuously by using a flow meter installed at the inlet pipe to the digester, data will be aggregated monthly. The flow meter will be subject to regular maintenance and calibration based on the manufacturer's specifications to ensure accuracy;
- Average chemical oxygen demand in the wastewater or sludge that is treated in the anaerobic digester ($w_{COD,dig,m}$): measured daily in accordance with national or international standards, results will be aggregated to monthly average and annual values. Sampling and testing will be carried out adhering to appropriate national/international standards recognized procedures to ensure accuracy, which is assumed to be above 95%;
- Average temperature at the project site in month m ($T_{2,m}$): data will be collected as daily mean, minimum and maximum temperature from the Philippines Meteorological Department for the monitoring station closest to the project site. Data temperature will be monitored continuously and aggregated in monthly average values;
- Net quantity of electricity generated in year y with biogas from the new anaerobic digester ($EG_{PJ,y}$): the net quantity electricity generated will be measured. The quantity of electricity associated with biogas will be calculated. The electricity output from the biogas fired generator sets will be recorded continuously by the meter provided with the electricity generator set. Electricity meters will undergo maintenance/calibration in accordance with appropriate national/international standards to ensure its accuracy, which is assumed to be above 95%.

  Net quantity of electricity generated using biogas from the new anaerobic digester will be determined based on the electricity generated from the turbine ($E_{TOT,y}$), electricity consumed from the wastewater treatment ($E_{con,WWT,y}$) and Fraction of heat/electricity associated with biogas at the turbine ($w_{biogas,y}$). The parameters $E_{TOT,y}$ and $E_{con,WWT,y}$ will be measured continuously by electricity meter. Electricity meters will undergo maintenance/calibration in accordance with appropriate national/international standards

to ensure accuracy. The parameter $w_{biogas,y}$ will be calculated on a monthly basis and averaged annually.

- Net quantity of heat generated in year y with biogas from the new anaerobic digester ($HG_{PJ,y}$): the net quantity of heat generated will be measured, and the quantity of heat associated with biogas will be calculated. Steam flow, pressure, and temperature of the steam will be measured continuously. The steam output from the biogas fired boilers will be measured continuously by the meter provided with the boiler.

  The net quantity of heat from biogas will be calculated by using the fraction of heat/electricity associated with biogas at the turbine ($w_{biogas,y}$), the quantity of steam generated from turbine ($F_{steam,y}$), enthalpy of the steam generated by the turbine ($E_{steam,y}$) and the heat content of the feed water entering boiler in year y ($E_{feed\ water,\ y}$).
- Fraction of heat/electricity associated with biogas at the turbine ($w_{biogas,y}$): calculated on a monthly basis and averaged annually, using the parameters $NCV_{biogas,boiler}$, $F_{biogas,boiler,y}$, $NCV_{dry\ vinasse,boiler,y}$, $F_{dry\ vinasse,\ boiler,y}$, $NCV_{bagasse,boiler}$, and $F_{bagasse,boiler,y}$.
- Net Calorific Value of biogas ($NCV_{biogas,boiler}$), dry vinasse ($NCV_{dryvinasse,boiler}$) and bagasse ($NCV_{bagasse,boiler}$): measured by a certified laboratory twice a year (every 6 months). Sampling and testing will be carried out adhering to appropriate national/international standards to ensure accuracy, which is assumed to be above 95%;
- Quantity of steam generated from the boiler ($F_{steam,y}$): measured continuously using a flow meter, data will be archived electronically. Flow meters will undergo maintenance/calibration in accordance with appropriate national/international standards to ensure its accuracy, which is assumed to be above 95%;
- Temperature and Pressure of the steam at the exit of the turbine (T_{steam} and P_{steam}): measured continuously with an appropriate measurement equipment, data will be aggregated monthly;
- Temperature of the of feed water in year y ($T_{feed\ water,y}$): to be measured using appropriate temperature measuring instrument, on a continuous basis, data will be aggregated monthly;
- Enthalpy of the steam generated by the boiler ($E_{steam,y}$): derived from engineering data books (e.g. steam tables) according to monthly average steam pressure and temperature, averaged annual;
- Heat content of the feed water entering boiler in year y ($E_{feed\ water,\ y}$): calculated on a monthly basis using $F_{feed\ water,y}$ and $T_{feed\ water,y}$, averaged annually;
- Quantity of feed water in year y ($F_{feed\ water,y}$): monitored continuously with a flow meter, and aggregated both monthly and annually;
- Electricity generated from the turbine in year y ($E_{TOT,y}$): measured continuously using electricity meter;
- Electricity consumed for the wastewater treatment in year y ($E_{con,WWT,y}$): measured continuously by electricity meter;
- Quantity of effluent from the digester in month m ($F_{PJ,eff,dig,m}$): measured continuously by flow meter, and data will be aggregated monthly and annually. Flow meters will undergo maintenance and calibration in accordance with appropriate national/international standards to ensure accuracy, which is assumed to be above 95%;

- Quantity of effluent from the open lagoon (emergency pond) in month m ($F_{PJ,eff,lag,m}$): measured continuously by flow meter, aggregated monthly and annually. Flow meters will undergo maintenance and calibration in accordance with appropriate national/international standards to ensure accuracy, which is assumed to be above 95%;
- Average COD in the effluent from the digester in month m ($w_{COD,effl,dig,m}$): measured daily from effluent COD according to national / international standards, calculation of monthly and annual averages;
- Average COD in the effluent from the lagoon (emergency lagoon) in month m ($w_{COD,effl,lag,m}$): measured daily from effluent COD according to national or international standards; average monthly and annual values will be calculated. Sampling and testing will be carried out adhering to appropriate national/international standards;
- Amount of biogas collected from the new digester in year y ($F_{biogas,y}$): measured continuously by flow meter (wet basis); data will be aggregated monthly and annually for calculations. Flow meters will undergo maintenance/calibration in accordance with manufacturer specifications to ensure accuracy, which is assumed to be above 95%;
- Amount of biogas sent to the boiler in year y ($F_{biogas,boiler,y}$): measured continuously by flow meter. Data will be aggregated monthly and annually for ER calculations. Flow meters will undergo maintenance/calibration in accordance with manufacturer specifications to ensure accuracy, which is assumed to be above 95%;
- Amount of dry vinasse sent to boiler in year y ($F_{dry\ vinasse,\ boiler,y}$): measured continuously by weighbridge. Data will be aggregated monthly and annually for ER calculations. The weighbridge will undergo maintenance/calibration in accordance with manufacturer specifications to ensure accuracy;
- Amount of bagasse sent to boiler in year y ($F_{bagasse,boiler,y}$): measured continuously by weighbridge. Data will be aggregated monthly and annually for ER calculations. The weighbridge will undergo maintenance/calibration in accordance with manufacturer specifications to ensure accuracy;
- Amount of biogas sent to the flare in year y ($F_{biogas,flare,y}$): measured continuously using a flow meter (wet basis), aggregated monthly and annually. Flow meters will undergo maintenance/calibration in accordance with manufacturer specifications to ensure its accuracy, which is assumed to be above 95%;
- Concentration of methane in biogas in the outlet of the new digester ($w_{CH4,biogas,y}$): measured quarterly on a 95% confidence level with a calibrated portable gas analyser by taking statistically valid number of sample measurements (measured either wet or dry, but on the same basis as the gas flow). The gas analyser will be subject to regular maintenance and calibration, based on the manufacturer's specifications to ensure accuracy;
- Project emissions from flaring of the residual gas stream in year y ($PE_{flare,y}$): determined as per the requirements of the tool to determine project emissions from flaring gases containing methane /88/;
- Temperature at flare exhaust (T_{flare}): measured continuously with thermocouple according to the tool to determine project emissions from flaring gases containing methane (version 1) /88/. Thermocouples will be replaced or calibrated every year. Data will be cross-checked with invoices, and equipment will be subject to regular maintenance, testing and calibration in accordance with manufacturer specifications to ensure accuracy;

- Volumetric fraction of component i in the residual gas in the hour h where i = CH_4 ($fv_{CH4,h}$): measured by continuous gas analyser;
- Volumetric flow rate of the residual gas at normal conditions in the hour h ($FV_{RG,h}$): measured continuously (dry or wet, same basis as $fv_{CH4,h}$);
- Other flare operation parameters: to monitor whether the flare operates within the range of operating conditions according to the manufacturer specifications including a flame detector. This will allow for a correct application of the Tool to determine project emissions from flaring gases containing methane /88/;
- Quantity of fuel type diesel combusted in the process during the year ($FC_{diesel,y}$): fuel consumption will be measured by using the fuel meters installed at the fuel storage tank and cross-checked with invoices. Meters will be periodically calibrated according to the manufacturer's recommendation to ensure accuracy, which is assumed to be above 95%;
- Weighted average net calorific value of fuel type diesel in year y (NCV_{diesel}): use of IPCC default values /99/ at the upper limit of uncertainty at a 95% confidence interval;
- Weighted average CO_2 emission factor of fuel type diesel in year y ($EF_{CO2,diesel,y}$): use of IPCC default values /99/ at the upper limit of uncertainty at a 95% confidence interval;
- Operation of the wastewater treatment per year: operating hours of the reactors will be recorded automatically and continuously.

4.7.3 Management system and quality assurance

The responsibilities and authorities for project management have been defined and procedures for monitoring and reporting, including QA/QC procedures, have been identified. With them in place, DNV is of the opinion that the project participants are capable of implementing the envisaged monitoring plan.

Monitored data will be recorded by using a data collection template for each parameter, archived electronically and kept for at least two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Application of the monitoring methodology is transparent and DNV considers that the project participants are capable of implementing the envisaged monitoring plan.

4.8 Algorithms and/or formulae used to determine emission reductions

Emission reductions are calculated in accordance with the applied baseline methodology ACM0014 (version 4.1.0) /87/ as the difference between baseline emissions, project emissions and leakage /2/.

Baseline emissions

In accordance with the methodology the baseline emissions are calculated as follow:

$BE_y = BE_{CH4,y} + BE_{EL,y} + BE_{HG,y}$

The formula above represents the sum of CH_4 emissions from anaerobic treatment of the wastewater in open lagoons in the absence of the project activity in year y ($BE_{CH4,y}$), CO_2 emissions associated with electricity generation that is displaced by the project activity and/or electricity consumption ($BE_{EL,y}$) and CO_2 emissions associated with fossil fuel combustion for heating equipment that is displaced by the project in year y ($BE_{HG,y}$).

a) CH_4 emissions from anaerobic treatment of the wastewater ($BE_{CH4,y}$)

Baseline emissions from anaerobic treatment of the wastewater are calculated by using (a) the Methane Conversion Factor Method out of two alternative methods described in ACM0014 (version 4.1.0) /87/. Hence, baseline emissions associated with anaerobic treatment of wastewater in the absence of the project are calculated by using the following equation:

$$BE_{CH4} = GWP_{CH4} \times MCF_{BL,y} \times B_O \times COD_{BL,y}$$

Both GWP_{CH4} (21 tCO_2e/tCH_4) and the maximum methane producing capacity B_o (0.21 $tCH_4/tCOD$) are fixed *ex-ante* as per the methodology and the values selected are in accordance with IPCC 2006 default values /87/.

For this greenfield project, no historical data is available in estimating both $MCF_{BL,y}$ and $COD_{BL,y}$. Hence, the percentage of COD that is degraded in open lagoons (AD_{BL}) was calculated based on the available design data of the COD inflow (125 000 mg/L) sourced from the annexure of the KBK contract with CADP Group Corp. /7/, the amount of wastewater (1 000 m^3/d) entering the system /5/ and the assumed operation of the treatment system of 300 days, as per the EIA issued in October 2008 /57/. The COD effluent is determined based on a 99.52% removal rate, calculated with a BOD_5 of 300 mg/L which is the regulatory limit of BOD_5 concentration in the final discharge effluent /19//21/, and a literature BOD_5/COD conversation factor of two (2) /54/. The reasonableness of both the BOD_5 limit and the conversion factor were confirmed by the independent wastewater expert /70//103/.

Volume of wastewater was estimated with a design flow rate of 1 000 m^3/d, evidenced by the feasibility study report /5/ and expected annual operation of 300 days /57/. The influence of the depth of the lagoon on methane generation (f_d) has been selected in line with ACM0014 version 4.1 /87/ as 70%, and it has been confirmed from the Lagoon Baseline Design Report that the most likely depth of the lagoon would be 6.5 m /17/. The parameter $f_{T,y}$ is calculated to be 0.97, where the monthly factor to account for the influence of the temperature on methane generation ($F_{t,m}$) is based on the average temperature in each month. The average temperature of 27.38 °C reported in the ER calculation worksheet /2/ is found to be in the same range as reported in the EIA /57/ and hence reasonable. Furthermore, a conservativeness factor of 0.89 has been taken into account.

b) CO_2 emissions from generation and/or consumption of electricity ($BE_{EL,y}$)

Baseline emissions from consumption of electricity associated with the treatment of wastewater and from the generation of electricity in the grid in the absence of the electricity generation with biogas are calculated as follows:

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

Annual quantity of electricity that would be consumed in the absence of the project activity for the treatment of the wastewater ($EC_{BL,y}$) is zero. In the absence of the project, wastewater would be the treated in open lagoons and electricity consumption, if any, would be minor and hence negligible. This is plausible and conservative in terms of ER calculations.

The net quantity of electricity generated with biogas from the anaerobic digester ($EG_{PJ,y}$) was calculated based on the net capacity of the system, i.e. the yearly capacity from biogas minus the power requirements of the wastewater treatment system /9/. The yearly capacity from biogas takes into consideration energy consumption of the plant /9/ and the percentage of

energy generated from biogas /5//10/ (31.34%) as compared to the amount resulting from bagasse /9//10/ (39.58%) and dry vinasse /9/ (29.08%).

Request for deviation: A request for deviation from the approved methodology ACM0014 (version 4.1.0) with reference number M-DEV0470 has been accepted by the EB on 8 May 2012 /94/. The request for deviation is summarized as follows:

Scenario 1 presented in the methodology ACM0014 (version 4.1.0) applies to the proposed Greenfield project, along with all other eligibility criteria listed /1/. As listed under scenario 1, the biogas extracted from the anaerobic digester will indeed be used to generate electricity and/or heat. The methodology /87/ is however not providing instructions for the monitoring of project emission where emission reductions are attributed only to one energy carrier (in this case biogas only, not bagasse, not dry vinasse). Parameters listed in equations 15 and 18 of the methodology relate to the net quantity of electricity and heat generated only. In order to calculate the emission reductions attributed only to one energy carrier (biogas) as more than one energy carrier is used in the project case, a deviation was requested in the way this can be calculated. DNV confirms that this is in accordance with the approved request for deviation from methodology approved by the UNFCCC for the specific proposed CDM activity /94/.

In accordance with the accepted request for deviation from methodology /94/, the fraction of heat and electricity generated attributed to biogas ($w_{biogas,y}$) is calculated based on the share of its energy content out of total energy content of all energy carriers as illustrated in the formula below.

$$w_{biogas,y} = (NCV_{biogas,boiler} * F_{biogas,boiler,y})/[(NCV_{dry\ vinasse,\ boiler} * F_{dry\ vinasse,\ boiler,y}) + \\ + (NCV_{bagasse,boiler} * F_{bagasse,boiler,y}) + (NCV_{biogas,boiler} * F_{biogas,boiler,y})]$$

$$w_{biogas,y} = (24\,480\ kJ/m^3 * 34\,450\ m^3/d * 300\ d/y) / [(12\,540\ kJ/kg * 1\,000\ kg/t * 62.4\ t/d * 300\ d/y) + \\ + (7\,500\ kJ/kg * 1\,000\ kg/t * 142\ t/d * 300\ d/y) + (24\,480\ kJ/m^3 * 34\,450\ m^3/d * 300\ d/y)] = \\ = 0.3134$$

Thus the emission reductions associated with electricity generation using biogas are determined as follow:

$$EG_{PJ,y} = (w_{biogas,y} * E_{tot,y}) - E_{con,\ WWT,y}$$

$$EG_{PJ,y} = [(0.3134 * 2\,800\ kW * 300\ d/y * 24\ h/d) – (729\ kW * 300d/y * 24\ h/d)] / 1\,000$$

$$EG_{PJ,y} = 1\,067\ MWh/y$$

c) CO_2 emissions from heat generation ($BE_{HG,y}$)

Baseline emissions associated with the combustion of fossil fuel in the boiler for heat generation were calculated by using the following equation:

$$BE_{HG,y} = \frac{HG_{PJ,y} \times EF_{CO2,FF,boiler}}{\eta_{BL,boiler}}$$

The net quantity of heat generated in year y with biogas from the new anaerobic digester ($BE_{HG,y}$) is based on the steam production of 360 t/d as projected by the project proponent. This is based on the steam extraction capacity pf of 15 tph of the steam turbine, 24h a day

/12/ . Furthermore, as explained in the above section, the percentage of energy generated from biogas has been used in the calculation.

In accordance with the request for deviation from the methodology /94/, the quantity of heat generated from biogas ($HG_{PJ,y}$) is calculated as follows:

$HG_{PJ,y} = w_{biogas,y} * [(F_{steam,y} * E_{steam,y}) - (E_{feed\ water,y})] / 10\ E9$

For purpose of *ex-ante* calculations, the enthalpy of feed water entering to the boiler is assumed at 2.64 E10 kJ/yr; assumptions are based on data made available by the project proponent /9/, however, the actual temperature and flow of feed water will be monitored *ex-post*.

$E_{feed\ water,y} = F_{feed\ water,y} * 300 * T_{feed\ water,y} * 4.1868\ kJ/kg\ C$

$HG_{PJ,y} = [0.3134 * [(360\ 000\ kg/d * 300d/y) * 3\ 238.9\ kJ/kg] - [210\ 000\ kg/d * 300\ d/y * 100\ ^{o}C * 4.1868\ kJ/kg\ C] / 10E9 = 101\ TJ/y$

The CO_2 emission factor of the fossil fuel type used in the boiler for heat generation in the absence of the project activity (72.60 tCO_2/TJ) was calculated by using the IPCC 2006 default carbon content for fuel oil /99/ and the mass conversion factor of 3.67 (tCO_2/tCO).

As explained above, the implementation of a captive co-generation plant in the baseline scenario for heat generation is not plausible. The baseline scenario for heat generation is the use of bagasse (when available) and bunkers fuel oil in a dual fuel boiler. The project activity will produce heat by burning bagasse, vinasse (dehydrated sludge) and biogas.

Given that the bagasse is a residue of the ethanol plant, it will be the primary feed into the boiler. Once all the bagasse has been used, the facility will burn bunker fuel oil in the case of the baseline scenario, while a combination of bagasse, vinasse and biogas will be used in the project activity. Therefore, the amount of bagasse burnt in the baseline scenario is the same amount of bagasse burnt by the project activity. The GHG emissions generated from burning bunker fuel oil in the baseline scenario are avoided in the project activity through the use of biogas and vinasse). Therefore, the emission factor for bunker fuel oil has been used for the calculation of the baseline emissions from the generation of heat. In addition, to enhance the conservativeness of the emission reduction calculation, only the emission reductions attributed to the biogas and not with the vinasse are being claimed by this project activity. This is shown in the emission reduction calculation for $BE_{HG,y}$ (Baseline emissions from the generation of heat), where the net quantity of heat generated in year y with biogas from the new anaerobic digester is accounted for.

The efficiency of the fossil fuel fired boiler that would be used for heat generation in the absence of the project is 89.8%.

In summary the baseline emissions are as follow:

$BE_y = BE_{CH4,y} + BE_{EL,y} + BE_{HG,y}$

$BE_y = 99\ 504\ tCO_2e/y + 578\ tCO_2e/y + 8\ 195\ tCO_2e/y = 108\ 277\ tCO_2e/y$

The grid emission factor (CEF_{grid})

The implementation of a captive co-generation plant in the baseline scenario for electricity generation is not plausible, and this option is no longer discussed. The baseline scenario for electricity generation is the use of electricity from the grid (E2). Hence, in accordance with ACM0014, the grid emission factor should be used ($EF_{BL,EL,y} = EF_{grid,y}$). Therefore, the grid emission factor has been identified for estimating the baseline emissions for generation and/or consumption of electricity as it is the only remaining option as per equation 16 in the methodology.

The baseline scenario for electricity generation is the use of electricity from the grid. The project activity will generate electricity by burning bagasse, vinasse (dehydrated sludge) and biogas. However, in order to be conservative only the emission reductions attributable to the collected biogas and no from vinasse or the bagasse will be claimed by this project activity. This is shown in the emission reduction calculation for $BE_{EL.y}$ (Baseline emissions from generation and/or consumption of electricity), where the net quantity of electricity generated in year y with biogas from the new anaerobic biodigester is accounted for.

The project's grid emission factor has been calculated for the combined Luzon-Visayas grid in the Philippines as the relevant electric power system. The grid emission factor is fixed *ex-ante* for the first crediting period, calculated as a combined margin (CM) consisting of the operating margin (OM) and build margin (BM). The calculations of the operating margin and build margin emission factor are based on option I of the Tool to calculate the emission factor for an electricity system (version 2.2.1) /90/, and it has been verified that only grid power plants are included in the calculations /4/.

The simple OM method has been applied correctly, as low cost/must run (LCMR) resources have been demonstrated to constitute less than 50% of the total grid generation in the most recent 5 years at the time of webhosting the PDD. In particular, LCMR resources are 28.04% in 2004, 27.56% in 2005, 31.22% in 2006, 27.43% in 2007 and 29.68% in 2008; values were calculated based on data from the Philippine Department of Energy (DoE) Power Statistics /98/ and consistently used in the grid emission factor spreadsheet /4/. The simple OM was calculated in accordance with the *ex-ante* option of the Tool to calculate the emission factor for an electricity system, based on a 3-year generation-weighted average, using the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system from 2006 to 2008. DNV confirms that calculations are based on the most recent data available at the time of submission of the CDM-PDD for global stakeholder consultation in February 2010. In addition, it was verified through the calculation that the CO_2 emission factors for the fossil fuel type used are the lower 95% confidence interval from IPCC 2006 Guidelines, Chapter 10 and Table 10.17 /99/. Hence, the simple OM results in 0.6296 tCO_2/MWh.

To calculate the BM, the sample group of power units used has been selected in accordance with the Tool to calculate the emission factor for an electricity system /90/. As such, a) the set of the 5 most recent power units and b) the units that comprise at least 20% of the system generation have been identified /4/. The set of power units that comprises the larger annual generation, (b) is applicable for the proposed project activity, has been used in the calculations. The BM is calculated to be 0.4537 tCO_2/MWh.

As a result, the combined margin is calculated as the weighted average of the emissions factor of the OM and the BM. As recommended by the Tool to calculate the emission factor for an electricity system /90/ default values of weighted factors $w_{OM} = 0.5$ & $w_{BM} = 0.5$ are used. Hence, the combined margin (CM) results in 0.5416 tCO_2/MWh.

Project emissions

Total estimated project emissions as per ACM0014 (version 4.1.0) /87/ are reported as the sum of the following parameters:

(i) Methane emissions from the open lagoons or dewatering process:

Not accounted for ex-ante emission reduction estimates. The effluent from the digester is not directed to open lagoons or a dewatering facility. The lagoon associated with the project is to be operated in the case of emergency only; any emissions from this source will be monitored and if any, considered for actual emission reduction calculations.

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

Methane emissions from the physical leakage of the new digester system are calculated by the following equation:

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

The amount of biogas collected in the outlet of the new digester in year y is estimated to be 34 450 m^3/d as per the feasibility study report /5/. The methane concentration of biogas is 55% and annual operation is estimated to be 300 days as per the EIA /57/. A default value of 0.05 m^3 biogas leaked/m^3 biogas produced was used as per the methodology ACM0014 (version 4.1.0) /87/ for the parameter $FL_{biogas,digest}$ equivalent to 5% leakage of biogas. The GWP is 21 and the methane density is 0.7168 $kgCH_4/m^3CH_4$.

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

Methane emissions from flaring are calculated in accordance with the latest tool to determine project emissions from flaring gases containing methane /88/. Mass flow rate of methane in the residual gas in the hour h is calculated with an estimated biogas flow rate of 34 450 m^3/d /5/ and a methane content of biogas of 55% /57/. The GWP is 21 and the methane density is 0.7168 $kgCH_4/m^3CH_4$.

The flare is expected to be operational only in case of emergency and during maintenance, estimated as 20 days/year. The flare efficiency of 0.5 has been selected for open flares, in accordance with the tool to determine project emissions from flaring gases containing methane /88/.

(iv) Methane and nitrous oxide emissions from land application of sludge:

Not accounted for. Final sludge will not be applied to land but used as auxiliary fuel in the new boiler for heat generation. The project will apply a zero-discharge policy as confirmed during the site visit and hence this step is not applicable.

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

Not accounted for. Wastewater will not be applied to land. Effluent from the anaerobic digester will be directed to an evaporator and dryer and the dry residual will be used as auxiliary fuel in the boiler for heat generation. In case of emergency, wastewater will be directed to an emergency lagoon; accounted under (i) Methane emissions from the open lagoons or dewatering process. The project will apply a zero-discharge policy as confirmed during the site visit and hence this step is not applicable.

(vi) CO_2 emissions from consumption of electricity and or fossil fuels in the project activity:

This emission source is applicable to the proposed project as the project activity may consume fossil fuels for captive diesel generator sets situated on site, although the project proponent

expects in principle that all electricity to be consumed by the project activity facilities will be sourced with biogas recovered.

CO_2 emission from fossil fuel combustion ($PE_{FC,y}$) are calculated using the latest approved version of the tool to calculate project or leakage CO_2 emissions from fossil fuel combustion /91/ as per the following equation:

$$PE_{FC,i,j,y} = FC_{i,j,y} \times NCV_{i,y} \times EF_{CO2,i,y}$$

The quantity of fuel combusted in the project activity during the year y is estimated based on the electricity consumption of the equipment installed on site. Equipment capacity has been derived from the annexure of the supply contract /7/ and annual operating time of 65 days/year has been estimated by the project proponent. The net calorific value of diesel is the IPCC default upper limit of uncertainty at a 95% confidence internal of 43.3 GJ/t is selected for the NCV of diesel.

The CO_2 emission coefficient of diesel (tCO_2/mass or volume unit) has been selected in accordance with the IPCC 2006 Guidelines /99/. The diesel density has been selected as per the diesel factsheet by the European Biodiesel Board /59/.

Leakage

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

In the project activity, no treatment of solid materials in the digester occurs and hence no leakage emissions are accounted for. This is deemed reasonable as per the project description.

Emission reductions

Based on the above calculations, the estimated annual average emission reductions of the proposed project activity are 101 122 tonnes of CO_2e over the first 7 year crediting period. The total estimated reductions for the first crediting period are 707 854 tonnes of CO_2e.

All assumptions and data used by the project participants are listed in the PDD and/or supporting documents, including their references and sources. All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD. All values used in the PDD are considered reasonable in the context of the proposed CDM project activity. The baseline methodology has been applied correctly to calculate baseline emissions, project emissions and emission reductions. All estimates of the baseline and project emissions can be replicated using the data and parameter values provided in the PDD.

4.9 Environmental impacts

An environmental impact assessment (EIA) has been undertaken for the project, issued by the CADP Group of Companies /57/. The EIA includes a general project description and an environmental impact and risk assessment on land, water, air quality and socio-economy. Furthermore, an environmental management and monitoring plan as well as social development plan is provided in the same document /57/.

The EIA is a requirement for the issuance of environmental compliance certificate (ECC) by the Environmental Management Bureau (EMB) Region 6, a regional office of the Department of Environment and National Resources (DENR). The ECC for the project activity has been issued by the DENR on the 9 January 2009 /58/, which is confirmation that the project is in compliance with environmental regulations in the host country.

DNV is able to verify that the aforesaid documents conclude that no significant environmental impacts are expected to result from the implementation of the proposed project activity; DNV is furthermore of the opinion that environmental impacts have been sufficiently described in the PDD /1/.

4.10 Comments by local stakeholders

Local stakeholders have been invited to a consultation meeting which was held on-site near La Carlota City on 20 September 2008.

Before the public consultation, the project participant also requested permission to present the project to the Sangguniang Panlunsod (SP) of La Carlota City on 16 July 2008 /64/. During the SP meeting, a representative from Roxol Bioenergy Corporation presented the profile of the proposed project activity to the members present, followed by an open forum to address comments on the location and technical stages of the project, probably impacts on health due to odour generation, air pollution as well as impacts on traffic, infrastructure and employment /65/.

The public consultation was held on 20 September 2008 at the covered court of Barangay Roberto S. Benedicto, La Carlota City. Various local stakeholders, namely village chairmen have been contacted by invitation letter to attend the meeting on 20 September 2008, as evidenced through sample invitation letters /66/.

During the public meeting, the design of the proposed project, the results of the feasibility study report, possible waste management options and the results of the environmental assessment were presented to the attendees. Stakeholders were also allowed to ask questions in an open forum /67/. The minutes of meeting have been verified by DNV /69/, where the main comments were summarized as discussions on employment opportunities, possible pollution to water bodies and water quality, odour control and information about the purchase of raw materials and the use of ethanol /69/. Furthermore, the list of attendees has been verified by DNV /68/.

A summary of comments received has been included in the PDD /1/.

Based on the assessment of the documents provided, in particular the minutes of meeting /65//69/, DNV confirms the statement in the PDD that no negative comments were received. Taking into account the evaluated information /64//65//66//67//68//69/, DNV considers the local stakeholder consultation carried out adequately.

4.11 Comments by Parties, stakeholders and NGOs

The PDD, version 01 dated 29 January 2010, was made publicly available on the CDM website and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 17 February 2010 to 18 March 2010.

(http://cdm.unfccc.int/Projects/Validation/DB/TEDQ47YBGWZXDX6UNSNCQIE1JUVVWA/view.html)

No comments were received.

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APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Mandatory requirements for Clean Development Mechanism (CDM) project activities

Requirement	Reference	Conclusion
About Parties		
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3.	Kyoto Protocol Art.12.2	OK
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	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	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 Procedures §40a	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 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	N/A No public funding is included
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 §30/31a	OK
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §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 Procedures §31b	OK
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the	Kyoto Protocol Art. 12.5c,	~~CL 2~~

Requirement	Reference	Conclusion
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 Procedures §43	~~CL 3~~ ~~CL 4~~ ~~CL 5~~ ~~CL 6~~ ~~CAR 1~~ OK
About forecast emission reductions and environmental impacts		
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	~~CL 7~~ ~~CL 8~~ OK
For large-scale projects only		
12. Documentation on the analysis of the environmental impacts of the project activity, including trans-boundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	OK
About stakeholder involvement		
- 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
- Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available.	CDM Modalities and Procedures §40	OK
Other		
13. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
14. 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 §45c,d	OK

Requirement	Reference	Conclusion
15. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	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	OK

Table 2 Requirements checklist

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A General description of project activity					
A.1 Title of the project activity (VVM para 55-57)					
A.1.1 Does section A.1 of the PDD include a clearly identifiable project title, version number of the PDD and date of the PDD?	/1/	DR	☒ Clearly identifiable title of the project activity ☒ Version number of the PDD is included ☒ Date of the PDD is included. PDD title, date and version number are all included in the PDD.		OK
A.1.2 Is the PDD is in accordance with the applicable requirements for completing PDDs?	/1/	DR	☒ Yes, this was checked during the completeness check during web-hosting of the PDD.		OK
A.2 Description of the project activity (VVM para 58-64)					
A.2.1 How was the design of the project assessed?	/1/ /5/ /6/ /7/ /8/ /11/ /12/ /13/ /14/	DR	*What type is the project?* ☐ Project in existing facility or utilizing existing equipment(s) ☐ Project is either a large scale project or a small scale project with emission reductions exceeding 15 000 tCO_2e per year. In this case, a site visit must be performed. ☐ Project is a bundled small scale project, with each project in the bundle with emission reductions not exceeding 15,000 tCO_2e per year. In such case the number of physical site visits may be based on sampling, if the sampling size is appropriately justified through statistical		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			analysis. ☐ The project is an individual small scale project activity with emission reductions not exceeding 15 000 tCO_2e per year. In this case, DOE may not conduct a physical site visit as appropriate. ☒ Greenfield project The proposed project activity is a Greenfield project, where the ethanol plant and wastewater treatment facility do not exist prior to the project activity. *How was the design of the project assessed?* ☒ Physical site inspection ☒ Reviewing available designs and feasibility studies Feasibility Study for Ethanol project for Roxas Holdings, Inc. was verified along with proposals received from prospective suppliers of the boiler and turbine.		
A.2.2 If a Greenfield project, describe the physical implementation of the project when the validation was commenced.	/1/	DR I	At the time of site visit, land clearing was completed. Construction was in progress, and was estimated to be 90% completed. Turbine and boiler were not installed yet.		OK
A.2.3 If physical site visits were performed based on sampling (only applicable for bundled small scale projects, each with emission reductions not exceeding 15 000 tCO_2e per year), justify the sampling through a statistical analysis:	/1/	DR I	Only one site is applicable to this project activity. Hence, sampling through site visit is not applicable.		OK
A.2.4 Is the description of the proposed CDM project activity as contained in the PDD sufficiently covers all	/1/	DR	Description of the proposed CDM project is sufficiently elaborated. Proposed CDM project is		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
relevant elements, is accurate and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity?			involves the installation of an advanced wastewater treatment system – an upflow-anaerobic sludge blanket (UASB) digester- at the newly-built Roxol Bioenergy Corporation's Ethanol Plant. The system will recover methane gas and use it, together with bagasse and dry vinasse, for steam production (110 TJ/y) and electricity generation (7,298 MWh/y)[1]. Under the project activity, the methane emissions generated during the ethanol plant wastewater treatment will be captured. Sludge produced will be burnt in the boiler together with the biogas and bagasse.		
A.2.5 Does the project activity involve alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/ /7/ /8/ /12/	DR	Project does not involve alteration of existing installation as confirmed through the contracts signed and relevant equipment proposals.		OK
A.2.6 Does the project design engineering reflect current good practices?	/1/	DR	Yes, project design engineering reflects good practice as it replaces electricity which is currently imported from the grid.		OK
A.2.7 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?	/1/	DR	Yes. The proposed project activity will reduce greenhouse gas emissions by installing an anaerobic wastewater treatment facility and co-generation unit. Project equipment will mainly be supplied by India and hence no technology transfer from an Annex I country is expected.		OK

[1] 110 TJ/y and 7,298 MWh/y are quantities of steam and electricity associated from biogas strictly.

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A.3 Participation requirements (VVM para 51-54, 125-127)					
A.3.1 Do all participating Parties fulfil the participation requirements as follows:	/1/	DR			OK
			Philippines (host) / The Netherlands		
a) Party has ratified the Kyoto Protocol			☒ Yes ☐ No / ☒ Yes ☐ No		
b) Party has designated a Designated National Authority			☒ Yes ☐ No / ☒ Yes ☐ No		
c) The assigned amount has been determined			☐ Yes ☒ No / ☐ Yes ☐ No		
A.3.2 Do the letters of approval meet the following requirements?	/1/ /83/	DR	The title of the project in the host country LOA refers to Methane Recovery from Advanced Wastewater Treatment System in an Ethanol Plant' which is not in accordance with the title of the Project in the PDD.	~~CL 1~~	OK
			Philippines (host) / The Netherlands		
a) LoA confirms that Party has ratified the Kyoto Protocol			☒ Yes ☐ No / ☒ Yes ☐ No		
b) LoA confirms that participation is voluntary			☒ Yes ☐ No / ☒ Yes ☐ No		
c) The LoA confirms that the project contributes to the sustainable development of the host country?			☒ Yes ☐ No / NA		
d) The LoA refers to the precise project activity title in the PDD			☐ Yes ☒ No / ☒ Yes ☐ No		
e) The LoA is unconditional with respect to (a) to (d) above			☒ Yes ☐ No / ☒ Yes ☐ No		
f) The LoA is issued by the respective Party's DNA			☒ Yes ☐ No / ☒ Yes ☐ No		
g) The LoA was received directly by the DNA or the PP			☐ DNA ☒ PP / ☐ DNA ☒ PP		
h) In case of doubt regarding the authenticity of the letter of approval, describe how it was verified that the letter of approval is authentic					
A.3.3 Have all private/public project participants been	/1/	DR	The project participants are Roxol Bioenergy	~~CL 1~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
authorized by an involved Party?	/83/ /84/		corporation (Roxol), The International Bank for Reconstruction and Development (IBRD) as trustee of the CDCF and the DNA of the Netherlands. The project participants are listed in Section A.3 of the PDD. However, the information is inconsistent with the contact details for Annex 1 party provided in Annex 1 of the PDD. The Host country's LoA identifies 'Roxol Bioenergy Corporation/Roxas Holdings, Inc.' as Philippine project participant which is not as in the PDD. This requires further clarification.		
A.4 Technical description of the project activity (VVM para 58-64)					
A.4.1 Is the project's location clearly defined?	/1/	DR I	The project is located in La Carlota City, Negros Occidental Province. The decimal GPS coordinates of the project are +10.4 latitude and +122.933 longitude, clearly specifying the project site.		OK
A.5 Public funding of the project activity					
A.5.1 In case 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 result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties?	/1/ /102/	DR I	The project does not involve any public funding from an Annex I Party but is financed through internal funding from the Roxas Holdings Inc. The validation did not reveal any information that indicated that the project can be seen as a diversion of official development assistance (ODA) funding towards the Philippines. This has also been confirmed with the DNA of the Philippines.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B Application of a baseline and monitoring methodology					
B.1 Methodology applied (VVM para 65-76)					
B.1.1 Does the project apply an approved methodology and the correct and valid version thereof?	/1/ /87/	DR	Yes. The proposed project activity applies the approved baseline methodology ACM0014 Version 4.1.0 'Mitigation of greenhouse gas emissions from treatment of industrial wastewater', for sectoral scope 13 'waste handling and disposal'.		OK
B.1.2 If applicable, has any specific guidance provided by the CDM EB in respect to the applied methodology been considered?	/1/ /89/ /90/ /91/ /92/	DR	The applied methodologies have considered the following guidance provided by CDM-EB: - '*Tool for the demonstration and assessment of Additionality'*, - '*Tool to determine project emissions from flaring gases containing methane'*, - '*Tool to calculate the emission factor for an electricity system'*, and - '*Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion'*.		OK
B.2 Applicability of methodology (and tools) (VVM para 65-76) *Insert a row for each applicability criteria of the applied methodology (and tools)*					
B.2.1 How was it validated that project complies with the following applicability criteria: Baseline situation Scenario 1 '*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*	/1/ /17/	DR	The project is a Greenfield project and in the baseline, the wastewater from the ethanol plant would have been directed to open lagoons. Different design options have been identified for the open lagoons, with an average depth of 3, 5 or 6 m and thus clearly anaerobic conditions. This		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
treatment than the wastewater'.			was confirmed by the' *Lagoon Baseline report'*.		
B.2.2 How was it validated that project complies with the following applicability criteria: The average depth of the open lagoons or sludge pits in the baseline scenario is at least 1 metre.	/1/ /17/	DR	The average depth is sourced from 'Roxol Bioenergy Corporation, 30 March 2010, Lagoon Design Baseline Report v.3'.		OK
B.2.3 How was it validated that project complies with the following applicability criteria: Heat and electricity requirements per input of the water treatment facility remain largely unchanged in the baseline scenario and the project activity.	/1/	DR	There is no heat or electricity requirement for wastewater treatment in the baseline scenario which is confirmed from site visit whereby wastewater is left to remain in the lagoons. Furthermore with the implementation of the project activity, 240 kWh of electricity will be supplied by the system generated electricity. As it has been demonstrated that it is contributing less than 1% of the overall expected average annual emissions rule as per the VVM, therefore, it has been sufficiently demonstrated that electricity and heat requirements remain largely unchanged.		OK
B.2.4 How was it validated that project complies with the following applicability criteria: Data requirements as laid out in this methodology are fulfilled.	/1/ /87/	DR	Data requirement as laid out in the methodology is transparently demonstrated in the PDD.		OK
B.2.5 How was it validated that project complies with the following applicability criteria: The residence time of the organic matter in the open lagoon system should be at least 30 days.	/1/ /17/	DR	Residence time of the organic matter in the open lagoon system has been sourced from Roxol Bioenergy Corporation's '*Lagoon Design Baseline Report'*.		OK
B.2.6 How was it validated that project complies with the following applicability criteria: Local regulations do not prevent discharge of wastewater in open lagoons.	/1/ /102/ /103/	DR I	There is no regulation in the host country that prevents the discharge of wastewater in open lagoons. Furthermore, the use of open lagoons is still considered common practise in The Philippines. This has been confirmed with a		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			representative of the Philippine DNA during the site visit, and the interview held with a local and independent sector expert.		
B.2.7 How was it validated that project complies with the following applicability criteria: Inclusion of solid materials in the project activity is only applicable where : (i) such solid materials are generated by industrial facility producing the wastewater, and (ii) the solid materials would be generated both in the project and in the baseline scenario.	/1/	DR	Solid material is not included in the project activity, hence it is deemed appropriate that this is not applicable.		OK
B.2.8 Is the selected baseline one of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/ /87/	DR	The baseline is further evaluated step-wise in accordance with the methodology, and hence applicability of methodology in selection of baseline is not applicable.		OK
B.3 Project boundary (VVM para 78-80)					
B.3.1 What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined and in accordance with the methodology?	/1/ /87/	DR	Yes. The project system boundary is in line with the approved CDM methodology ACM0014 version 4.1.0. The spatial extent of the project boundary includes the site where the wastewater is treated is treated in both the baseline and the project scenario. The equipment included in the project boundary is the bio-digester, the power and heat generation facility, the flaring system and the dewatering facility (evaporator) installed at the project site.		OK
B.3.2 Which GHG sources are identified for the project? Does the identified boundary cover all possible sources linked to the project activity? Give reference to documents considered to arrive at this conclusion.	/1/ /2/ /5/ /17/	DR I	**Baseline emissions:** - CH_4 emissions from anaerobic treatment of the wastewater or sludge disposal; - CO_2 emissions from generation and/or		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			consumption of electricity; and - CO_2 emissions from generation of heat. **Project emissions:** - CH_4 emissions from effluent from the digester: treatment of effluent from the anaerobic digester (CH_4) is accounted under the project activity assuming effluent from the treatment under project activity is directed to open lagoons (emergency pond) - Physical leakage of methane from the digester system is accounted for; - Methane emissions from flaring are accounted for, and (v) methane emissions from wastewater removed in the dewatering process is not accounted for; - CO_2 emissions from electricity consumption and combustion of fossil fuels. The identified boundary cover all possible sources linked to the project activity as confirmed from *Feasibility Study for Ethanol project for Roxas Holdings, Inc.* and Roxol Bioenergy Corporation's, '*Lagoon Design Baseline Report'*.		
B.3.3 Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources contribute with more than 1% of the estimated emission reductions of the project?	/1/	DR	All emission sources have been included in the methodology. The project is not expected to involve other emissions not foreseen by the methodologies.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.4 Baseline scenario determination (VVM para 81-88, 105-107) *Ensure that the evaluation of all alternatives provided in the PDD and required by the methodology and also possible alternatives/offshoots of alternatives are discussed. Check that all alternatives required to be considered by the methodology are included in the final PDD. If baseline alternatives required to be considered by the methodology are considered not applicable, please assess the justification for this.*					
B.4.1 Which baseline scenarios have been identified? Is the list of baseline scenarios complete?	/1/ /87/	DR	In line with the approved baseline methodology ACM0014 the following baseline scenarios have been discussed: For **wastewater treatment** component: - W1. The use of open lagoons for the treatment of wastewater; - W2. Direct release of wastewater to a nearby water body; - W3. Aerobic wastewater treatment facilities; - W4. Anaerobic digester with methane recovery and flaring; - W5. Anaerobic digester with methane recovery and utilization for electricity or heat generation (the project) without being developed as a CDM project. - W6. Anaerobic digester with methane recovery and production of electricity or heat generation sale to the grid (electricity) or nearby off-takers – without being	~~CAR 1~~ ~~CAR 2~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			developed as a CDM project; - W7: Wastewater is directed to land application without dewatering; - W8: Wastewater is dewatered and directed to land application. For **electricity generation** component: - E1. Power generation using fossil fuels in a captive power plant. - E2. Electricity generation in the grid. - E3. Electricity generation using renewable sources. E4. Electricity generated from biogas undertaken without being registered as a CDM Project activity. For **heat generation** component: - 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. - H4. Heat generated from biogas undertaken without being registered as a CDM Project activity. DNV considers the list of baseline scenarios complete. The methodology further requires identification of realistic and credible combinations of scenarios for wastewater treatment (W) and,		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			where applicable, the treatment of sludge (S), the generation of electricity (E) and the generation of heat (H). Combinations of scenarios were not considered from Step 2 onwards.		
B.4.2 How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/	DR	Please refer to B.4.1. Elimination of baseline scenarios shall use realistic and credible combined scenarios.	~~CAR 1~~ ~~CAR 2~~	OK
B.4.3 What is the baseline scenario?	/1/	DR	Baseline scenario has been identified as W1 (The use of open lagoons for the treatment of wastewater), E2 (Electricity generation in the grid), H2 (Heat generation using fossil fuels in a boiler). However, the elimination of baseline scenarios requires review as in B.4.1.	~~CAR 1~~ ~~CAR 2~~	OK
B.4.4 Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/	DR	Please refer to B.4.1.	~~CAR 1~~ ~~CAR 2~~	OK
B.4.5 Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	Please refer to B.4.1.	~~CAR 1~~ ~~CAR 2~~	OK
B.4.6 Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/ /19/ /20/ /21/	DR	Yes. The baseline scenario sufficiently takes into account the following regulations: - Republic act No. 9275 – Philippines Clean Water Act of 2004, adopting the effluent standards of DENR DAO 35-1990; - DENR: Administrative Order No. 34, Series of 1990; - DENR: Administrative Order No. 35, Series of 1990; and - The Philippines: Republic Act No. 9136,		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Reforms in the public power industry.		
B.4.7 Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	Clear references have been provided in the PDD.		OK
B.4.8 Is the baseline determination adequately documented in the PDD? • All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. • All documentation is relevant as well as correctly quoted and interpreted. • Assumptions and data can be deemed reasonable • Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. • The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/1/	DR	The following has been verified from site visit: - Assumptions and data used in the PDD have been properly referenced and justified; - Documentation has been correctly quoted and interpreted; - Assumptions and data have been transparently justified; - Relevant national and sectoral policies are considered and listed in the PDD; - The methodology however has not been correctly applied to identify what would occur in the absence of the project. Refer B.4.1.	~~CAR 1~~ ~~CAR 2~~	OK
B.5 Additionality determination (VVM para 94-121 121)					
B.5.1 What approach/tool does the project use to assess additionality? Is this in line with the methodology?	/1/ /87/ /89/	DR	As required by the methodology ACM0014, the project applies the latest version of the 'tool for the demonstration and assessment of Additionality' version 6.1.0.		OK
B.5.2 Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/ /19/ /20/ /21/	DR	Yes. The baseline scenario sufficiently takes into account the following regulations: - Republic act No. 9275 – Philippines Clean Water Act of 2004, adopting the effluent standards of DENR DAO 35-		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			1990; - Rule No. 19.6 of the RA 9275; - DENR DAO No. 10 Series of 2005.		
B.5.3 Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	Yes. Sufficient evidence has been provided to support the relevance of the arguments made.		OK
B.5.4 What is the project additionality mainly based on (Investment analysis or barrier analysis)?		DR	To demonstrate the project Additionality the project participants applied an investment analysis.		OK
Prior consideration of CDM (VVM para 98-103)					
B.5.5 What is the evidence for serious consideration of CDM prior to the time of decision to proceed with the project activity?	/1/ /23/ /24/ /28/	DR	A project idea note (PIN) was submitted to the World Bank on 21 March 2007 and further evidence for prior consideration of CDM has been provided in form of an e-mail conversation between the project participant and the World Bank, dated 1 May 2007. A request for revision of the approved consolidated baseline methodology ACM0014 to include Greenfield projects has been submitted to the secretariat on 12 January 2008. Relevant evidence has been verified by DNV. Serious consideration of CDM prior to the time of decision to proceed with the project activity has been sufficiently demonstrated.		OK
B.5.6 If the starting date is after 2 August 2008 and before the global stakeholder consultation, has the DNA and UNFCCC confirmed that the project participants have informed in writing of the project's intention to seek CDM status?	/1/ /7/	DR	The starting date of the project is 27 June 2008, which is before 2 August 2008. Thus, it is not required to inform the DNA and UNFCCC in writing about the project's intention to seek CDM status.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)					
B.5.7 What initiatives where taken by the project participants from the starting date of the project activity to the start of validation in parallel with the physical implementation of the project activity?	/1/ /22/	DR I	The project participants signed an ERPA for the project activity on 14 January 2009. Furthermore, the contract with the validating DOE was signed in December 2009 and the PDD was web-hosted for GSC in February 2010.		OK
B.5.8 When did the construction of the project activity start?	/1/ /7/	DR	The chronology of events in the PDD indicated signing of '*Construction Contract for ethanol plant and wastewater treatment Signed between Roxol and KBK'* on 27 June 2008. It is unclear when the actual construction of the project activity started. Documented evidence is requested.	~~CL 2~~	OK
B.5.9 When was the project commissioned?	/1/	DR	It is unclear if project has started commissioning. Clarification is requested.	~~CL 2~~	OK
B.5.10 Does the timeline of the project confirm that continuous actions in parallel with the implementation were taken to secure CDM status?	/1/	DR	It has been sufficiently demonstrated that continuous actions in parallel with the implementation were taken to secure CDM status.		OK
Investment analysis (VVM para 108-114) *The list of questions below must be adjusted to the parameters in the investment analysis relevant to the project under validation.*					
B.5.11 Does the project activity or any of the remaining alternatives generate revenues apart from CDM? Is this reflected in the PDD?	/1/	DR	The project activity is to produce biogas using bio-digestion and the generation of heat and electricity for internal use. It remains to be proven if remaining alternatives generate revenues apart from CDM. Refer to B.4.1.	~~CAR 1~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.12	Do any of the alternatives to the project activity involve investment? Is this reflected in the PDD?	/1/	DR	The baseline alternatives to the project have been identified as (i) the use of open lagoons for the treatment of wastewater; (ii) electricity generation in the grid and (iii) heat generation using fossil fuels in a boiler. None of these alternatives involve investment. This is reflected in the PDD.		OK
B.5.13	Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/ /3/	DR	'Investment comparison analysis' was carried out for the project activity. The financial indicator (NPV) of two remaining alternatives has been compared, and the choice of financial analysis is reasonable. Further explanation is provided in table 3 of this report (refer to Appendix A and B).		OK
B.5.14	Is the benchmark/discount rate the latest available at the time of decision?	/1/ /3/ /26/	DR	2007 Government bond rate and sovereign risk have been used as discount rate for the proposed project. This is deemed appropriate as the decision for the project to go ahead was demonstrated to take place in 2007 based on the board meeting dated 15 November 2007. However, a 364 maturity-day Government bond has been chosen. It needs to be clarified why this is considered conservative.	~~CL 3~~	OK
B.5.15	What is the financial indicator? Is it on equity/project basis? Before/after tax? Is the financial indicator in correspondence with the benchmark?	/1/	DR	The financial indicator is project IRR pre-tax. Yes, financial indicator corresponds with the benchmark.		OK
B.5.16	Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is	/1/	DR	Yes. Underlying assumptions are appropriate.		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	considered to have zero value?					
B.5.17	Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with normal accounting practice in the host country?	/1/	DR	Income tax calculation does not take depreciation into account.		OK
B.5.18	Is the time period of the investment analysis and operating time of the project realistic? Has salvage value been taken into account? Is working capital returned in the last year of operation?	/1/ /31/	DR	Operational lifetime of 25 years has been chosen for the proposed project. A letter issued by the technology provider (letter dated 2 April 2010) has been furnished and is deemed appropriate. No depreciation has been considered and hence salvage value has not been taken into account, which is deemed appropriate.		OK
B.5.19	When a feasibility study report or similar approved by the government is used as the basis for the investment analysis: Can it be confirmed that the values used in the PDD are fully consistent with the FSR and is the period of time between finalization of the FSR and the investment decision adequate?	/1/ /5/	DR	Feasibility Report (dated July 2008) was used as basis for investment analysis. Various options were considered in the Feasibility Report, and Option 6 (Concentration of Raw Vinasse and Combustion in Boiler) the proposed project activity was referred to. Though the investment cost is slightly different with the projected financial cost presented to the board on 15 November 2007 (i.e. PhP 1 188 million), the Feasibility Report cost is more conservative (PhP 105 million). DNV considers the 8 month period between projected cost and Feasibility Report is adequate and does not result in significant change to the investment decision.		OK
B.5.20	How was the amount of output (e.g. sales of electricity) assessed? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with	/1/ /8/ /9/ /12/	DR	☐ The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity	~~CL 4~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
VVM paragraph 95.			for implementation approval ☐ The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company) ☒ Other approach. *Provide details on how the load factor was validated::* Steam production (110 TJ/y) and electricity generation (7 298 MWh/y) has been assumed based on following: The following are assumptions used: - 4MW turbine capacity, - 1 000 m^3/day of wastewater - 300 days of operation, entering the system, and - 34 459 Nm^3/day biogas is fed to the 40T/hour boiler. a. For electricity generation, 7 298 MWh/y net generation is based on: - biogas providing 31% of energy, - Bagasse providing 40% energy, - Dry vinasse providing 29% energy. b. For steam generation, ((110 TJ/y) , steam that is generated from biogas represents about 30% of the total energy produced from the boiler based on Roxol Ethanol Plant Power Mix		

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				The assumptions made in the document 'Roxol Ethanol Plant Power Mix, 2009' to derive the generation of electricity and steam need to be included in the PDD and transparently calculated in the emission reduction spreadsheet.		
B.5.21	How was the output price (e.g. electricity price) assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /36/ /37/ /38/	DR I	☒ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants *Provide details on how the output price was validated:* The saving from importing of electricity was based on electricity tariff of National Power Corporation average price in 2007 which is deemed appropriate as CDM was considered in November 2007. The saving from use of steam has appropriately considered average price of bunker oil in 2006. As CDM was considered in 2007, inflation rate in 2007 has been considered and factored in to arrive at estimate price of bunker oil in 2007. DNV considers this appropriate as CDM was considered in 2007. An escalation of price of bunker oil and electricity need to be taken into account due to the increase in global fossil fuel price.	~~CL 5~~	OK
B.5.22	How were the investment costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and	/1/ /5/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.			announcements, contracts and annual financial reports related to the project and the project participants *Provide details on how the investment costs were validated:* Feasibility Report (dated July 2008) was used as basis for investment analysis. Various options were considered in the Feasibility Report, and Option 6 (Concentration of Raw Vinasse and Combustion in Boiler) the proposed project activity was referred to. Though the investment cost in Feasibility Report is slightly different with the projected financial cost presented to the board on 15 November 2007 (i.e. PhP 1 187.85 million), the Feasibility Report cost is more conservative (PhP 105 million). DNV considers the 8 month period between projected cost and Feasibility Report is short enough that the Feasibility Report data is deemed appropriate to be used as investment figures.		
B.5.23	How were the O&M costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /5/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants *Provide details on how the O&M costs were validated:* O&M cost has been sourced from Feasibility Report, and has considered direct labour cost, fuel cost and maintenance cost. The total O&M is		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				considered as direct operating cost (2.6% of investment cost) is considered appropriate and conservative.		
B.5.24	Describe the assessment of the other input parameters. Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM paragraph 95.	/1/ /5/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants *Provide details on how other input parameters were validated:* Feasibility Report (dated July 2008) was used as basis for investment analysis. Various options were considered in the Feasibility Report, and Option 6 (Concentration of Raw Vinasse and Combustion in Boiler) the proposed project activity was referred to. Though the investment cost is slightly different with the projected financial cost presented to the board on 15 November 2007 (i.e. PhP 1 187.85 million), the Feasibility Report cost is more conservative (PhP 105 million). DNV considers the 8 month period between projected cost and Feasibility Report is short enough that the Feasibility Report data is used as investment decision.		OK
B.5.25	Was the financial calculation spreadsheet verified and found to be correct?	/1/ /3/	DR	Financial calculation spreadsheet has been verified and found to be correct.		OK
B.5.26	Sensitivity analysis: Have the key parameters contributing to more than 20% of the revenue/costs during operating or implementation been identified?	/1/ /3/	DR	Yes. Key parameters contributing to more than 20% of the revenue/costs during operating or		OK

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	Has possible correlation between the parameters been considered?			implementation have been identified.		
B.5.27	Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/ /3/	DR	+/- 10% variations have been demonstrated for key parameters, namely capital cost, electricity generated, heat generated and O&M. The range of variations is deemed reasonable.		OK
B.5.28	Have the key parameters been varied to reach the benchmark and the likelihood of this to happen been justified to be small?	/1/ /3/	DR	The sensitivity analysis does not include a variation of parameters up to when the benchmark is reached. Explanations for the likelihood of variations to happen is not sufficiently referenced in the PDD; data sources for all assumptions made have to be included.	~~CL12~~	OK
Barrier analysis (VVM para 115-118)						
B.5.29	Are the barriers identified complimentary to a potential investment analysis? Does the barrier have a clear impact on the financial returns so that it can be assessed in an investment analysis? Each barrier is discussed separately.	/1/	DR	N/A. To demonstrate the project's Additionality the project participants applied the investment analysis.		N/A
B.5.30	How were the investment barriers assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/1/	DR	N/A		N/A
B.5.31	How does CDM alleviate the investment barriers?	/1/	DR	N/A		N/A
B.5.32	Is the project activity prevented by the investment barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	N/A		N/A
B.5.33	How were the technological barriers assessed to be real? Are the technological barriers substantiated by	/1/	DR	N/A		N/A

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	a source independent of the project participants?					
B.5.34	How does CDM alleviate the technological barriers?	/1/	DR	N/A		N/A
B.5.35	Is the project activity prevented by the technological barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	N/A		N/A
B.5.36	How were the barriers due to prevailing practise assessed to be real? Are the barriers due to prevailing practise substantiated by a source independent of the project participants?	/1/	DR	N/A		N/A
B.5.37	How does CDM alleviate the barriers due to prevailing practise?	/1/	DR	N/A		N/A
B.5.38	Is the project activity prevented by the barriers due to prevailing practise and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	N/A		N/A
B.5.39	How were the other barriers assessed to be real? Are the other barriers substantiated by a source independent of the project participants?	/1/	DR	N/A		N/A
B.5.40	How does CDM alleviate the other barriers?	/1/	DR	N/A		N/A
B.5.41	Is the project activity prevented by the other barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	N/A		N/A
Common practice analysis (VVM para 119-121)						
B.5.42	What is the geographical scope of the common practice analysis? Is this justified?	/1/	DR	The geographical scope of the common practise analysis is The Philippines. This is deemed justified in the context of the project.		OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.43	What is the scope of technology and size (e.g. capacity of power plant) for the common practice analysis and how has this been justified?	/1/ /56/ /62/	DR	It has been demonstrated that there are currently only two ethanol plants in the Philippines. This has also been confirmed with the local DNA. One is CDM registered project and with slightly different technology. The other plant, Layte Agri Corporation is also an ethanol plant but is claimed as using stabiliser and wastewater is treated in a collecting pond. This has been confirmed with email communication with Layte Corporation.		OK
B.5.44	What is the data source(s) used for the common practice analysis?	/1/	DR	The source of information provided by Philippines Department of Energy is requested.	~~CL 6~~	OK
B.5.45	How many similar non-CDM-projects exist in the region within the scope?	/1/ /102/	DR I	There is not known non-CDM project in the Philippines. This has been confirmed with DNA of the Philippines.		OK
B.5.46	How were possible essential distinctions between the project activity and similar activities assessed?	/1/ /56/	DR	It is claimed that Layte Agri Corporation wastewater treatment is using collecting pond. This has been confirmed by Layte Agri in email.		OK
B.5.47	What is the conclusion of the common practice analysis?	/1/	DR	Conclusion of common practice analysis is pending closure clarifications raised in B.5.44.	~~CL 6~~	OK
Conclusion						
B.5.48	What is the conclusion with regard to the Additionality of the project activity?	/1/	DR	Pending closure of clarifications raised.	~~CL 2~~ ~~CL 3~~ ~~CL 4~~ ~~CL 5~~ ~~CL 6~~ ~~CAR 1~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.6 Calculations of GHG emission reductions					
Data and parameters that are available at validation and that are not monitored (VVM para 199-203)					
B.6.1 How was the inflow/outflow COD and the COD removal rate of the wastewater treatment plant verified?	/1/ /2/ /17/	DR	$COD_{in,x}$ = 37 500 t COD/y and $COD_{out,x}$ = 180 t COD/yr. The COD_{in} is 125 000 mg/l as per the design data of the wastewater treatment plant. This is in line with the methodology, which specifies the use of design COD inflow for COD_{in}. The following assumptions were used: - $COD_{in,x}$ = 37,500 t COD/y is sourced from Annexure from supplier, - Conversion of COD of inflow to BOD_5 is based on conversion factor of 2 (Beltran de Heredia), - Removal efficiency (99.52%) have been calculated based on the maximum allowable limit for BOD_5 (300 mg/l), equivalent to 600mg/l COD as per environmental regulations. This is sourced from '*Lagoon baseline report*'. DNV considers these appropriate.		OK
B.6.2 How was the maximum methane production capacity (B_o) verified?	/1/ /87/	DR	B_o has been selected as a conservative assumption as outlined in the approved baseline methodology. A value of 0.21 t CH_4/tCOD is used which is deemed conservative.		OK
B.6.3 How was the factor expressing the influence of the depth of the lagoon on methane generation (f_d) verified?	/1/ /17/	DR	*'Lagoon Baseline Report'* has demonstrated depth of 5.5m which corresponds to f_d value of 0.7. This is correctly stated in the PDD.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.6.4 How was the average depth of lagoon (D) verified?	/1/ /17/	DR	Average depth of lagoon has been sourced from *'Lagoon Baseline Report'* at 5.5 metre which is correctly stated in the PDD.		OK
B.6.5 How was the annual quantity of electricity (EC_{BL}) that would be consumed in the absence of the project activity verified?	/1/	DR	In the absence of the project activity, the lagoon based system will be used and there is no electricity requirement for the system. The wastewater will flow through the lagoon system by gravity. This is deemed appropriate, and confirmed from site visit.		OK
B.6.6 How was the grid emission factor/baseline emission factor verified?	/1/ /4/ /90/ /98/	DR	Grid emission factor has been calculated using "*Tool to calculate the emission factor for an electricity system*". It is unclear which source is used in data for calculation of $EF_{grid,CM,y}$ and if the data is the latest data available at the time of PDD publication on 17 February 2010. Combined margin CO_2 emission factor for grid (CEF_{grid}) calculation has been demonstrated in the PDD and spreadsheet. The electricity system for this project has been identified as the Luzon-Visayas grid. The calculation used in this PDD is up to 2008. In accordance with the "*Tool to calculate the emission factor for an electricity system*", the electricity baseline emission factor is determined *ex-ante* as a combined margin consisting of the weight average of the operating margin emission factor (EF_{OM}) and the build margin emission factor (EF_{BM}). In accordance with the "*Tool to calculate the emission factor for an electricity*	~~CL 7~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			system", the electricity baseline emission factor is determined *ex-ante* as a combined margin consisting of the weight average of the operating margin emission factor (EF_{OM}) and the build margin emission factor (EF_{BM}). ***Step 1: Identify the relevant electric power system*** The identified grid is the Luzon-Visayas grid. ***Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)*** This step is not addressed. ***Step 3: Select a method to determine the operating margin (OM)*** For simple OM Method, the demonstration of 'low-cost/must-run resources constitute less than 50% of total grid generation', data from 2005 to 2007 was used. This has been appropriately demonstrated in the spreadsheet *'Philippines Grid EF'*. A 3-year generation-weighted average has been calculated, assuming the most recent data available at the time of submission of the CDM-PDD to the DOE is 2008. This is deemed appropriate. However, it was noted that the data used in the calculation are gross power generation. This requires review as in accordance with "*Tool to calculate the emission factor for an electricity*		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			system", data used has to be net electricity generation of all generating power plants. ***Step 4: Calculate the operating margin emission factor according to the selected method*** PDD states that *'Simple OM' ($EF_{OM,simple,y}$) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources in the system, excluding low-cost and must-run resources'*. However in accordance with "*Tool to calculate the emission factor for an electricity system*", option A (*Calculation based on average efficiency and electricity generation of each plant*) requires further clarification as calculation of net average energy efficiency ($\eta_{m,y}$) has not been transparently demonstrated in the spreadsheet. This needs to be addressed. ***Step 5: Identify the group of power units to be included in the build margin*** The set of five power units that have been built most recently has been demonstrated to comprise larger generation. For the Luzon-Visayas grid, the most recent capacity additions representing 20% of the system comprise larger annual generation than the 5 most recent plants, and are therefore the chosen as the build margin sample group.		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			This has been transparently demonstrated in the spreadsheet. ***Step 6: Calculate the build margin emission factor*** The Build Margin emissions factor (BM) is calculated as the generation-weighted average emission factor of the most recently built plants. The calculation of '*average efficiency and electricity generation of each plant*' ($\eta_{m,y}$) to calculate $EF_{EL,m,y}$ has not been transparently demonstrated. ***Step 7: Calculate the combined margin emissions factor*** Electricity baseline emission factor is calculated as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$) where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$). CEF_{grid} was calculated to be 0.5416 tCO_2/MWh.		
B.6.7 How was the CO_2 factor of the fossil fuel type used in the captive power plant verified?	/1/ /99/	DR	CO_2 factor of the fossil fuel type used in the captive power plant (bunker fuel oil) has been sourced from IPCC as there is no local data available.		OK
B.6.8 How was the efficiency of the boiler that would be used for heat generation in the absence of the project verified?	/1/ /8/	DR	This has been sourced from the technical specification of '*Boiler 40 TPH & Paddle Mixer, 10 September 2008, KBK'*, at 70%.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.6.9 How was the fraction of biogas that leaks from the digester verified?	/1/ /87/	DR	Default leak factor as per the approved methodology ACM0014 at 0.05 m^3 biogas leaked/ m^3 biogas produced has been chosen.		OK
B.6.10 How was surface of the lagoon verified?	/1/ /17/	DR	Surface lagoon has been sourced from *'Lagoon Baseline Report'*. The most likely option, i.e. option 3 has been chosen which is deemed appropriate.		OK
B.6.11 How was the global warming potential for CH_4 verified?	/1/	DR	Default value of 21 tCO_2/CH_4 is deemed appropriate.		OK
B.6.12 How was the following parameters available at validation verified: - Molecular mass of methane, - Molecular mass of nitrogen, - Atmospheric pressure at normal conditions, - Atmospheric pressure at normal conditions, - Universal ideal gas constant, - Temperature at normal conditions, and - Methane density at normal conditions.	/1/ /88/	DR	"*Tool to determine project emissions from flaring gases containing methane"* was used for the following parameters: - Molecular mass of methane (MM_{CH4}, 16.04), - Molecular mass of nitrogen (MM_{N2}, 28.02), - Atmospheric pressure at normal conditions (P_n, 101,325 Pa), - Universal ideal gas constant (R_u, 8,314.472 $Pa.m^3/kmol.K$), - Temperature at normal conditions (T_n, 273.15K), - Methane density at normal conditions ($\rho_{CH4,n}$, 0.0007168 tCH_4/m^3CH_4).		OK
Baseline emissions (VVM para 89-93)					
B.6.13 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Pending closure of clarifications raised.	~~CL 7~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.6.14	Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	Pending closure of clarifications raised.	~~CL 7~~	OK
B.6.15	Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	Pending closure of clarifications raised.	~~CL 7~~	OK
Project emissions (VVM para 89-93)						

B.6.16	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /57/ /87/ /88/ /91/	DR	Project emissions have been calculated as per the approved CDM methodology ACM0014 version 4.1.0. According to the methodology project emissions result from (i) treatment of wastewater effluent from anaerobic digester, (ii) physical leakage of methane from the anaerobic digester , (iii) methane emissions from flaring, and (iv) electricity consumption and combustion of fossil fuels in the project.
				For (i): the treatment of wastewater from lagoon will only be directed to a lagoon in emergency. This is not considered *ex-ante* but will be monitored ex-post.
				For (ii): The physical leakage of the digester will be calculated by using a default value of 0.05 for the fraction of biogas that leaks in the outlet of the new digester. The methane concentration is deemed appropriate and assumed to be 55%, as estimated from '*Environmental Impact Assessment (EIA) for the Ethanol Production and Wastewater Methane Capture Project'*.
				For (iii): The '*tool to determine project emissions from flaring gases containing methane'* has been applied. The flare will be operated only during
					~~CAR 2~~ ~~CL 8~~ ~~CAR 2~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			maintenance and in emergency cases; therefore the amount of biogas sent to the flare equals the amount of biogas collected in the outlet of the digester. For ex-ante estimations the flare operation is estimated to be 20 days and the flare efficiency is considered to be 50% (open flare). Evidence for the flare operation has been provided. For (iv): electricity consumption and combustion of fossil fuels in the project is assumed using diesel generator with NCV and emission factor sourced from IPCC. In accordance with '*Tool to calculate baseline, project and/or leakage emissions from electricity consumption'*, when IPCC default is used, upper limit of uncertainty at 95% has to be applied. This requires review. It is stated in the PDD that sludge will be used as compost. It needs to be clarified how the compost will be processed and applied to not consider the project emissions from land application of sludge. As part of the project activity emission reduction calculation, the net quantity of electricity generated in year y with biogas from the new anaerobic system (EGPJ,y) and the net quantity of heat generated in year y with biogas from the new anaerobic digester (HGPJ,y) are calculated based on a new parameter wbiogas,y (the fraction of heat/electricity associated with biogas at the turbine). As per the terms described in EB49		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Annex 4, the project participants deviate from AM00014 version 4.1.0, when applying the methodology to the proposed project activity. Updated due to RfR: Sludge will not be used as compost, but burnt in the boiler along with the biogas and bagasse		
B.6.17 Have conservative assumptions been used when calculating the project emissions?	/1/	DR	Refer to B.6.17.	~~CAR 2 CL 8~~	OK
B.6.18 Are uncertainties in the project emission estimates properly addressed?	/1/	DR	Pending closure of clarification raised.	~~CAR 2 CL 8~~	OK
Leakage (VVM para 89-93)					
B.6.19 Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Leakage emissions are only calculated for Scenario 1 type projects that include treatment of solid materials in the digester in the project activity. The sludge produced by the project activity will be burnt in the boiler along with the biogas and bagasse..		OK
B.6.20 Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	N/A		OK
B.6.21 Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	N/A		OK
Emission Reductions (VVM para 89-93)					
B.6.22 Algorithms and/or formulae used to determine emission reductions: • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced	/1/	DR	Pending from the resolution of CLs.	~~CL 7 CL 8~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
• All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity • The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.					
B.7 Monitoring plan (VVM para 122-124)					
Data and parameters monitored					
B.7.1 Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/ /87/	DR	Yes. The monitoring plan is in accordance with the requirements outlined in the approved monitoring methodology ACM0014 version 4.1.		OK
B.7.2 Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/	DR	Yes, the monitoring plan has included and clearly described necessary parameters.		OK
B.7.3 In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/ /87/	DR	The following parameters will be monitored: 1. Quantity of wastewater that is treated in the anaerobic digester in month m ($F_{PJ,dig,m,}$, m^3/month) measured using magnetic flow meter installed in-line of the influent pipe to the digester, 2. Average chemical oxygen demand in the effluent entering the digester ($w_{COD, dig,m,}$ t COD / m^3) measured according to national or international standards, 3. Average temperature at the project site in month *m* (T_2, K) recorded from daily mean, minimum and maximum temperature readings from Philippines Meteorological Department for a	~~CL 9~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			temperature monitoring station, La Granja, La Carlota City, Neg. OCC Station, 4. Net quantity of electricity generated in year *y* with biogas from the new anaerobic system ($EG_{PJ,y}$, MWh/year), net quantity electricity generated will be measured and quantity of electricity associated with biogas will be calculated, 5. Net quantity of heat generate in year *y* with biogas from the new anaerobic digester ($HG_{PJ,y,}$ TJ/year) and steam output from the biogas fired boilers will be recorded on a daily basis by the meter provided with the boiler and net quantity heat generated will be measured with quantity of heat associated with biogas will be calculated, 6. Quantity of effluent form the digester in month *m* ($F_{PJ,effL,dig,m,}$ (m^3/month) and $F_{PJ,lag,m}$ (m^3/month) measured using flow meter, 7. Average chemical oxygen demand in the effluent from the digester in month *m* ($w_{COD,effl,dig,m}$), measured daily according to national or international standards, 8. Average chemical oxygen demand in the effluent from the lagoon (emergency lagoon) in month *m* ($w_{COD,effl,lag,m}$), measured daily according to national or		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			international standards, 9. Total amount of biogas collected from the new digester in year *y* ($F_{biogas,y}$), monitored continuously on wet basis, 10. Amount of biogas sent to boiler in year *y* ($F_{biogas,boiler,y}$) monitored continuously using flow meter, 11. Amount of biogas sent to flare in year *y* ($F_{biogas,flare,y,}$), flow rate will be monitored continuously on wet basis, 12. Concentration of methane in biogas in the outlet of the new digester ($w_{CH4,biogas,y}$), measurement will be conducted quarterly based on a 95% confidence level using a calibrated portable gas meter by taking statistically valid number of sample measurements, 13. Project emissions from flaring of the residual gas stream in year y ($PE_{flare,y),}$ monitored as per the "*Tool to determine project emissions from flaring gases containing methane (Version 1)",* 14. Temperature at flare exhaust (T_{flare}), measured continuously using thermocouple, 15. Volumetric fraction of component i in the residual gas in the hour h where i = CH_4 ($fv_{CH4,\mathbf{h}}$), measured continuously using gas analyzer, 16. Volumetric flow rate of the residual gas at		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			normal conditions in the hour h ($FV_{RG,h}$), flowmeter measured continuously and value averaged hourly, 17. Other flare operation parameters (all data and parameters that are required to monitor whether the flare operates within the range of operating conditions according to the manufacturer specifications including a flame detector), 18. Quantity of fuel type diesel combusted in the process during the year combusted in the process during the year *y* ($FC_{diesel,,y}$), measured using the fuel meters installed at the fuel storage tank, 19. Weighted average net calorific value of fuel type diesel in year *y* ($NCV_{diesel)}$, future revision of the IPCC Guidelines, 20. Weighted average CO_2 emission factor of fuel type diesel in year *y*($EF_{CO2,diesel,y)}$, future revision of the IPCC Guidelines, and 21. Operating hours per year of the wastewater treatment plant for each (Operation of the wastewater treatment per year). Clarification is requested for the following monitoring parameters: - Section B.7.2 of the PDD lists a set of 'data and parameters monitored' which		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			are misleading as these are not as in B.7.1. of the PDD, - Mass of bagasse and dry vinasse are not included as monitoring parameters though considered in energy mass balance calculation to calculate net quantity of electricity generated and net quantity of heat generated *ex-post*, - NCV of biogas, bagasse and vinasse are claimed to be measured by certified laboratory in comments in B.7.1. of PDD monitoring parameters ($EG_{PJ,y}$ and $HG_{PJ,y}$) however is not included as monitoring parameter,and - Total electricity generated from the turbine ($E_{tot,y}$).		
B.7.4 In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR	The measurement accuracy is not described for all relevant parameters.	~~CL10~~	OK
B.7.5 In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant parameter.	/1/	DR	Yes. Requirements for maintenance and calibration are sufficiently described in the PDD. Calibration and maintenance will be carried out in line with industry standards and manufacturer specifications were applicable. This is defined for the following measurement equipment: (i) wastewater/effluent flow meters; (ii) electricity output meter; (iii) steam output meter and (iv) gas flow meters.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.7.6 Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	Monitoring frequency has been listed adequately for all monitoring parameters in the monitoring plan and is deemed appropriate.		OK
Ability of project participants to implement monitoring plan					
B.7.7 How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/ /101/	DR I	During the site visit DNV checked the company's infrastructure and interviewed the responsible monitoring people. DNV considers the monitoring plan feasible.		OK
B.7.8 Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)?	/1/	DR	Monitored data will be aggregated monthly and/or annually and data will be archived on paper and/or electronically as relevant. Data will be recorded by using a collection template for each parameter and responsibilities for record handling have been defined in the monitoring plan. However, no clear procedures for day-to-day record handling have been described in the PDD and procedures need to be in place at verification.	~~CL 10~~	OK
B.7.9 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?	/1/	DR	Procedures for data management and quality assurance are not sufficiently described in the PDD (i.e. procedures for training of monitoring personnel, procedures for emergency preparedness for cases where emergencies can cause unintended emissions, procedures to identify corrective actions in order to provide for more accurate future monitoring and reporting, etc.).	~~CL 10~~	OK
B.7.10 Will all monitored data required for verification and	/1/	DR	Yes. All monitored data will be kept for two		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
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?			years after the crediting period.		
Monitoring of sustainable development indicators/ environmental impacts					
B.7.11 Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/ /87/	DR	The approved methodology ACM0014 does not account for the monitoring of sustainable development indicators. During the site visit, the DNA has noted that there is a need to have a supplemental policy to monitor the Sustainable development (SD) of a project. Currently, however, only pilot testing is performed and thus, the monitoring of SDI is not required for the project activity.		OK
B.7.12 Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	N/A		OK
B.7.13 Are the sustainable development indicators in line with stated national priorities in the host country?	/1/	DR	N/A		OK
C Duration of the project activity / crediting period					
C.1.1 Start date of project activity (VVM para 99-100, 104)					
C.1.2 How has the starting date of the project activity been determined? What are the dates of the first contracts for the project activity? When was the first construction activity?	/1/ /7/	DR	The starting date is the 27 June 2008, which is the date when the construction contract was signed. It is unclear when the first construction activity started. Documented evidence is requested to demonstrate the said activity.	~~CL 2~~	~~OK~~
C.1.3 Is the stated expected operational lifetime of the	/1/	DR	Operational lifetime of 25 years has been chosen for the proposed project. A letter issued by the		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
project activity reasonable?	/31/ /92/		technology provider (letter dated 2 April 2010) has been furnished. This is deemed appropriate.		
C.1.4 Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/1/	DR	A renewable crediting period has been selected for the project activity. The length of the first crediting period is 7 years. The starting date of the first crediting period is stated to be the 1 April 2011 or the date of registration of the project activity. This requires revision.	~~CL11~~	~~OK~~
D Environmental Impacts (VVM para 131-133)					
D.1.1 Are there any host country requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved? Does the approval contain any conditions that need monitoring?	/1/ /57/ /58/	DR	Yes. An Environmental Impact Assessment (EIA) has to be conducted according to DNA requirements of the host country (DENR, Administrative Order No. 2003-30). The EIA for the project activity has been carried out by the CADP Group of Companies and was approved by the DENR through the issuance of an environmental compliance certificate (ECC) on 9 January 2010. Both documents have been verified by DNV. The approval of the EIA does not contain any conditions that need monitoring.		OK
D.1.2 Does the project comply with environmental legislation in the host country?	/1/ /58/ /102/	DR I	Yes. The project complies with environmental legislation in the host country, which has been confirmed by the ECC of the project and with local authorities during the site visit.		OK
D.1.3 Will the project create any adverse environmental effects?	/1/ /57/ /58/	DR	The project does not create significant environmental impacts, which has been confirmed through the EIA and the ECC, issued by the Department of Environment and Natural Resources.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
D.1.4 Have identified environmental impacts been addressed in the project design?	/1/	DR	Yes. Environmental impacts have been sufficiently described in the project design.		OK
D.1.5 Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/	DR	Yes. The analysis of environmental impacts has been sufficiently described in the PDD and relevant documentation has been provided.		OK
D.1.6 Are trans-boundary environmental impacts considered in the analysis?	/1/ /57/	DR	The project will not create any trans-boundary environmental impacts.		OK
E Stakeholder Comments (VVM para 128-130)					
E.1.1 Have relevant stakeholders been consulted?	/1/ /66/ /67/ /68/ /69/	DR	Yes. Local stakeholders have been invited to a stakeholder consultation meeting, which was held on 20 September 2008. Invitation letters were sent to various stakeholders. A sample letter of invitation, lists of invitees and attendees as well as minutes of meeting have been provided.		OK
E.1.2 Have appropriate media been used to invite comments by local stakeholders?	/1/ /66/	DR	Local stakeholders have been invited by invitation letters.		OK
E.1.3 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?	/1/	DR	Yes. The local stakeholder consultation has been carried out in accordance with regulations in the host country. Following a 1st level project briefing at the Environmental Management Bureau on 16 July 2008, a 2nd level public scoping with the community (the GSC) has been conducted. Furthermore, a 3rd level technical scoping has been performed by submitting the pro-forma technical scoping for evaluation to the review		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Committee.		
E.1.4 Is a summary of the stakeholder comments received provided?	/1/	DR	Yes. A summary of the comments received is included in the PDD.		OK
E.1.5 Has due account been taken of any stakeholder comments received?	/1/	DR	Due account was taken and incorporated in the Section E.2. Questions raised by the stakeholders were with regards to employment opportunities and the river pollution and odor. No adverse comments were received.		OK

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
CAR 1 *Baseline determination:* The methodology requires identification of realistic and credible combinations of scenarios for wastewater treatment (W) and, where applicable, the treatment of sludge (S), the generation of electricity (E) and the generation of heat (H). Combinations of scenarios were not considered from Step 2 onwards.	B.4.1 to B.4.5 B.4.8 B.5.11 B.5.48	Combinations have been included, starting at the end of step 1 as per the methodology requirement. However the methodology clearly refers to "alternatives" not combinations in steps 2 and 3, so the alternatives are discussed and again at the end of each step the combinations are listed. Baseline presentation has been adjusted as per the methodology and the Tool. Appropriate references have been added to relevant sections.	DNV has checked the PDD /1/ and confirms that the PDD now considers combinations of scenarios from step 2 onwards in accordance with the methodology applied. **CAR is closed.**
CAR 2 *Baseline determination:* As a result of the request for review raised, justification is needed on other plausible scenarios for heat and power generation baseline alternatives, not restricted to those mentioned within the methodology.	B.4.1 to B.4.5 B.4.8 B.5.11 B.5.48	The list of alternatives scenarios for electricity and heat generation has been updated, now including the combination of fuel types with renewable energy as feasible scenarios (see new scenarios highlighted in bold below). *Alternatives scenarios for electricity:* • E1. Power generation using fossil fuels in a captive power plant; • E2. Electricity generation in the grid; • E3. Electricity generation using renewable sources; • E4. Electricity generation using a combination of grid electricity and	The CAR has been raised as a result of the request for review. The list of possible alternatives for electricity and heat scenario has been increased, not limited to the options listed in the methodology. As a result, the latest PDD now discusses the following: *Alternatives scenarios for electricity:* • E1. Power generation using fossil fuels in a captive power plant; • E2. Electricity generation in the grid; • E3. Electricity generation using renewable sources; • E4. Electricity generation using a

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		renewable energy sources; • E5. Electricity generation using a combination of renewable energy sources and biogas undertaken without being developed as a CDM Project. *Alternatives scenarios for heat generation:* • 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; • H4. Heat generation using a combination of fuel types; including renewable sources; • H5. Het generation using a combination of fuel types: renewable sources and biogas undertaken without being developed as a CDM Project – New. These new scenarios have been incorporated to the latest version of the PDD.	combination of grid electricity and renewable energy sources; • E5. Electricity generation using a combination of renewable energy sources and biogas undertaken without being developed as a CDM Project. *Alternatives scenarios for heat generation:* • 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; • H4. Heat generation using a combination of fuel types; including renewable sources; • H5. Het generation using a combination of fuel types: renewable sources and biogas undertaken without being developed as a CDM Project. The combination of credible alternatives has also been expanded from 7 combinations to 8 plausible combinations in the latest PDD as listed in the "Summary of credible alternatives" table. All the

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			alternatives in the new complete list are assessed. **CAR is closed.**
CAR 3 *Emission reduction calculation:* As part of the project activity emission reduction calculation, the net quantity of electricity generated in year y with biogas from the new anaerobic system ($EG_{PJ,y}$) and the net quantity of heat generated in year y with biogas from the new anaerobic digester (HGPJ,y) are calculated based on a new parameter $w_{biogas,y}$ (the fraction of heat/electricity associated with biogas at the turbine). As per the terms described in EB49 Annex 4, the project participants deviate from AM00014 version 4.1.0, when applying the methodology to the proposed project activity.	B.6.16 to B.6.18	A request for deviation was submitted to the CDM EB (ref: M-DEV0470) and approved on May 8th 2012.	The PDD /1/ and emission reduction spreadsheet /2/ have been updated as part of the request for deviation. The request for deviation M-DEV0470 was accepted by the UNFCCC on the 8 May 2012 /94/. **CAR is closed.**
CL 1 There is inconsistency in the LoA and PDD: a. The name of the project participant listed in section A.3 of the PDD is inconsistent with the contact details provided in Annex 1 of the PDD. b. The title of the project in the LoA is different from the title of the project in the PDD.	A.3.2. A.3.3.	An updated LOA has been submitted to DOE.	The PDD /1/ in section A.3 and Annex 3 has been updated due to the fact that the host country LoA refers to a project title that is slightly different from the initial PDD webhosted for GSC, and the name of the project participant is reported consistently. Furthermore, the project title is now consistent in the PDD and both the LoAs of host country /83/ and Annex 1 party /84/. **CL is closed.**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CL 2 *Chronology of events:* The chronology of events in the PDD indicated signing of '*Construction Contract for ethanol plant and wastewater treatment Signed between Roxol and KBK'* on 27 June 2008. It is unclear when the actual construction of the project activity started. Documented evidence is requested.	B.5.8 B.5.9 C.1.2	Please refer to the attached official communication on Project Progress Report (MPR-817-01) indicating the progress as on 31 July 2008. On page 19, you can see that "site execution" started on 27 June 2008 with the site cleaning. The project commissioning date was originally planned as 19 December 2009. Electricity and heat generation were originally planned to start in January 2011, which was used for the investment analysis The actual project construction schedule is attached (refer to implementation status.ppt). Due to technical complications the wastewater treatment system has not been fully functional. Please see the email from Roxol. From the conversation with Roxol, the commercial run of the plant is now expected to be completed on or before June 2012. Project implementation schedule has been updated in the PDD. ERs are not expected before registration, estimated 01/09/2012 due to registration	DNV has reviewed the project progress report showing the project progress as of 31 July 2008 /16/ and confirmed that the project started construction with the site cleaning on 27 June 2008 /7/. DNV has verified through the review of the KBK letter dated 9 May 2012 /75/ that the commission of the waste water treatment plant was June 2011. DNV also confirm that the PDD /1/ has been updated and correctly include the project implementation schedule as per the evidence reviewed. The commercial run of the WW treatment plant is expected to be completed by the end of August 2012. **CL is closed.**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		delays.	
CL 3 *Benchmark and Investment analysis:* 2007 Government bond rate and sovereign risk have been used as benchmark for the proposed project, and a 364 maturity-day Government bond has been chosen. It needs to be clarified why this time period is considered conservative.	B.5.14.	We are using this value (12%) as a discount rate (not benchmark). This is relevant since the project include renewable electricity generation. Please note that EB has published defaults values/country specific Benchmarks (EB61): the same value is used for both waste and energy sectors.	The selected discount rate for the project, i.e. the generation of heat and electricity by using biogas from a wastewater treatment process is 12%, derived from the Power Supply Plan for the Philippine national grid published on the official webpage of the Philippine Department of Energy /45/. The latest EB Guidelines on the assessment of investment analysis /93/ defines a discount rate of 12.75% in the Philippines for Group 1, including energy industries (scope 1) and waste handling and disposal (scope 13). DNV has verified that the selected discount rate for the project (12%) is before tax /45/, and therefore it is more conservative than the default (post-tax) value (12.75%) of the EB "Guidelines on the assessment of investment analysis" /93/ and is thus reasonable. **CL is closed.**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CL 4 *Emission reduction calculation:* The assumptions made in the document 'Roxol Ethanol Plant Power Mix, 2009' to derive the generation of electricity and steam need to be included in the PDD and transparently calculated in the emission reduction spreadsheet.	B.5.20.	Revisions were done to sections B.6.1 & B.6.3 to provide equations and transparent ex-ante calculations of electricity and heat associated with biogas.	Section B.6.1 and B.6.3 of the PDD /1/ have been revised to include further clarification to the power mix. Relevant information with regard to the generation of electricity and steam has furthermore been consistently used in the emission reduction calculation /2/. **CL is closed.**
CL 5 *Investment analysis:* The saving from importing of electricity and use of steam has appropriately been considered as revenue to the project. However, an escalation of price of bunker oil and electricity need to be taken into account due to the increase in the global fossil fuel price.	B.5.21.	Price escalation is not considered since the financial analysis is done in "real terms", not in nominal terms, thus the O&M are also fixed and no escalation is considered. Furthermore, the sensitivity analysis is already covering the effect of the price of the bunker fuel oil/electricity on the project IRR. This is now clearly explained in the PDD in section B.5, under Sensitivity analysis (i.e., before the price of bunker fuel oil/electricity were not presented separated from the impact of the increased production of heat and electricity).	DNV has checked the investment analysis /3/ of the project activity and confirm that the calculation are done is real term thus it is in DNV's opinion correct not to include price escalation. **CL is closed.**
CL 6 *References:* The source of information in the document 'DOE-ACCREDITED BIOETHANOL PROCEDURES' dated 17 August 2009 is requested.	B.5.44. B.5.47	Available at: http://www.doe.gov.ph/AF/BioethanolAccredit.htm. Attached with the response for easy reference.	The requested information as referred to in the PDD /1/ has been provided. **CL is closed.**
CL 7 *Grid emission factor:* Grid emission factor has been calculated using	B.6.6 B.6.13 B.6.14	a. Sources are provided with the response. Confirmation that data were the latest available on Feb 17 2010 is provided in	a. Sufficient evidence has been provided through an e-mail from the DOE of the Philippines /46/, confirming that the grid

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
"*Tool to calculate the emission factor for an electricity system*". Clarification is requested for: a. It is unclear what is the source of data used in the calculation of $EF_{grid,CM,y}$ and if the data is the latest data available at the time of PDD publication on 17 February 2010, b. It was noted that the data used in the calculation are gross power generation. This requires review as in accordance with "*Tool to calculate the emission factor for an electricity system*", data used has to be net electricity generation of all generating power plants, and c. In both calculation of Operating Margin and Build Margin, calculation of net average energy efficiency ($\eta_{m,y}$) has not been transparently demonstrated in the spreadsheet.	B.6.15 B.6.22	email from DOE dated Feb, 25 2011. b. Net electricity generation data provided by Philippines Department of Energy have been used throughout the latest grid emission factor calculation (Please refer to the Philippines Grid EF 06-08 (latest).xls). c. The energy efficiency factors ($\eta_{m,y}$) adopted in the OM and BM calculation are sourced from Annex 1 of the "*Tool to calculate the emission factor for an electricity system*"- version 2.	emission factor has been calculated based on latest data available at the time of web-hosting the PDD in February 2008. b. Net electricity generation data has been used to calculate the grid emission factor. The latest calculation spreadsheet provided is entitled 'Philippines Grid EF March 2011.xls' /4/. c. Energy efficiency factors have been confirmed to be derived from Annex 1 of the Tool to determine the emission factor from an electricity system /90/. **CL is closed.**
CL 8 *Emission reduction calculation:* a. Electricity consumption and combustion of fossil fuels in the project is assumed using diesel generator with NCV and emission factor sourced from IPCC. This requires review as in accordance with '*Tool to calculate baseline, project and/or leakage emissions from electricity consumption'*, in the absence of national data and IPCC default is used, upper limit of uncertainty at 95% has to be applied.	B.6.16 B.6.17 B.6.22	a. Adjustments have been made to section B.7.1 of the PDD and on EF and NCV for diesel as per the tool. These changes have also been reflected in project emission calculations. b. The sludge under the project situation would be burnt as fuel, thus there is not compost *ηm,y is from the Tool v 2.2 (annex 1).* *Sludge disposal: a statement was included in section A.4.3 of the PDD.*	a. DNV has verified that the PDD /1/ section B.7.1 has been correctly updated. DNV confirm that the PDD now correctly describe NCV diesel as per the tool. The IPCC default upper limit of uncertainty at a 95% confidence internal of 43.3 GJ/t is selected for the NCV of diesel /99/, since no data from supplier are available. b. It has been clarified that the project activity has implemented a zero effluent discharge approach, and thus it does not

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
b. It is stated in the PDD that sludge will be used as compost. It needs to be clarified how the compost will be processed and applied to not consider the project emissions from land application of sludge.			generate any emissions from the sludge treatment. The residual sludge from the anaerobic digester will be dried in the evaporator/dewatering facility (the dehydrated product is called vinasse) and then used as fuel in the boiler along with the bagasse and biogas. **CL is closed.**
CL 9 *Monitoring plan:* Clarification is requested for the following monitoring parameters: - Section B.7.2 of the PDD lists a set of 'data and parameters monitored' which are misleading as these are not as in B.7.1. of the PDD, - Mass of bagasse and dry vinasse are not included as monitoring parameters though considered in energy mass balance calculation to derive the net quantity of electricity generated and heat generated *ex-post*, - NCV of biogas, bagasse and vinasse are claimed to be measured by certified laboratory in comments in B.7.1 of the PDD monitoring parameters ($EG_{PJ,y}$ and $HG_{PJ,y}$), however these parameters are not included as monitoring parameters in B.7.1.,and - Total electricity generated from the turbine ($E_{tot,y}$) is not monitored.	B.7.3.	- Monitoring diagram was reviewed and presented in Annex 4 only. Section B.7.2 is referring to Annex 4. - Mass of bagasse and dry vinasse have been included in the monitoring table. - NCV for all relevant material have been included. - Electricity total has been included. All relevant points for monitoring listed are listed on monitoring diagram (Annex 4). All relevant points on the diagram are also listed in section B.7.1. EF have been revised on PDD consistently. EF has been updated to version 2.2 of the tool.	DNV has reviewed the revised PDD /1/, and confirm that the PDD has been revised in accordance with the methodology ACM0014 (version 11) /84/. All parameters are now correctly included in section B.7.1 of the PDD, and DNV is of the opinion that the monitoring plan will allow for a transparent and accurate monitoring. The assessment of monitoring procedures as outlined in the PDD /1/ is described in detail in the respective section of this report. **CL is closed.**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CL 10 *Monitoring plan:* The measurement accuracy is not described for all relevant parameters.	B.7.4.	Sampling and testing will be carried out adhering to appropriate national/international standards to ensure accuracy assumed to be above 95%. Accuracy, when relevant is listed in section B.7.1.	DNV has checked all parameters in the monitoring plan in the PDD /1/ and confirm that measurement accuracy is now correctly indicated for the relevant parameters. A detailed assessment is provided in section 4.7 of this report. **CL is closed.**
CL 11 *Crediting period:* A renewable crediting period has been selected for the project activity. The length of the first crediting period is 7 years. The starting date of the first crediting period is stated to be the 1 April 2011 or the date of registration of the project activity. This requires revision.	C.1.4.	In PDD reviewed to 31 December	The crediting period has been revised and is anticipated to start on 31 December 2012. This is deemed reasonable. **CL is closed.**
CL 12 *Sensitivity analysis:* The sensitivity analysis does not include a variation of parameters up to when the benchmark is reached. Explanations for the likelihood of variations to happen is not sufficiently referenced in the PDD; data sources for all assumptions made have to be included.	B.5.28	A sensitivity analysis including the variation of parameters up to when the benchmark is reached is included in the PDD (section B.5.) for all relevant parameters (bunker fuel avoided, electricity production, bunker fuel oil tariff, electricity tariff, investment costs, O&M) and combinations of scenarios (i.e., W5, E4, H4 & W1, E2, H2)	The sensitivity analysis has been correctly updated in the PDD /1/. The analysis now shows the variation of the parameters up to the IRR reaches the benchmark. Furthermore, the likelihood that such variation are unlikely to happen during the project lifetime have also been clearly justified in the PDD. A description about the assessment of the sensitivity analysis is presented in section 4.6 of this report. **CL is closed.**

Table 4 Forward action requests

Forward action request	Reference to Table 2	Response by project participants
FAR		Not applicable

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APPENDIX B

INITIAL CDM VALIDATION PROTOCOL

Table 2 Requirements Checklist

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A General description of project activity					
A.1 Title of the project activity					
A.1.1 Does section A.1 of the PDD include a clearly identifiable project title, version number of the PDD and date of the PDD?	/1/	DR	☒ Clearly identifiable title of the project activity ☒ Version number of the PDD is included ☒ Date of the PDD is included. PDD title, date and version number are all included in the PDD.		OK
A.1.2 Is the PDD is in accordance with the applicable requirements for completing PDDs?	/1/	DR	☒ Yes *If no, list where the PDD is not in accordance:* N/A		OK
A.2 Description of the project activity					
A.2.1 How was the design of the project assessed?	/1/	DR I	*What type is the project?* ☐ Project in existing facility or utilizing existing equipment(s) ☐ Large scale project ☐ Bundled small scale projects, each with emission reductions not exceeding 15 000 tCO_2e per year ☐ Individual small scale project activity with emission reductions not exceeding 15 000 tCO_2e per year ☒ Greenfield project *How was the design of the project assessed?* ☒ Physical site inspection ☒ Reviewing available designs and feasibility studies *If a physical site inspection is not undertaken,*		OK

MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			justify why no site visit was undertaken: N/A		
A.2.2 If a Greenfield project, describe the physical implementation of the project when the validation was commenced.		DR I	The PDD for the project was web-hosted on 17 February 2010 and the physical site inspection took place on 1-2 March 2010. According to the project schedule that has been provided to DNV, the erection of equipment at site started in March 2009. At the time of the site visit, the construction of the project has not been completed. *The planned and actual timeline with regard to the physical implementation of the project (project start up activities, basic engineering, purchase orders, start of construction, commissioning, performance testing) needs to be updated in the PDD.*	~~CL1~~	OK
A.2.3 If physical site visits were performed based on sampling (only applicable for bundled small scale projects, each with emission reductions not exceeding 15 000 tCO_2e per year), justify the sampling through a statistical analysis.	/1/	DR	N/A		OK
A.2.4 Is the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity?	/1/	DR I	The project activity is a greenfield project and involves the installation of a new ethanol plant and wastewater treatment facility. Spent-wash of the distillery (designed for 1 000 m^3/d) will be treated in two bio-digesters with a buffer-tank capacity of 500 m^3/d each. The produced biogas will be used to generate steam and electricity for internal use. The installed boiler is a natural circulation bi-drum water tube with a capacity of 40 TPH, connected to a steam turbine with an inlet steam pressure of 34 kg/cm^2 and a nominal output of 4 MW. Excess biogas	~~CL2~~	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			will be flared. *Further evidence is requested and the PDD shall be updated including the following information: (i) sludge generation and handling in the baseline/project activity; (ii) wastewater treatment in the case of emergency; (iii) whether all steam produced by the boiler is fed to the steam turbine (i.e. energy balance); (iv) further explanation on the indicated 60% biogas, 40% biomass fuel mix and its composition (i.e. calculation); (v) electricity consumption in the case of emergency/break-down of equipment; (vi) the key technical parameters of the flare and (vii) information for meeting and maintenance needs of project equipment.*		
A.2.5 Does the project activity involve alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/	DR	The project activity is a greenfield project and hence does not involve the alteration of existing installations. This has been clearly described in the PDD and confirmed from the feasibility study report.		OK
A.2.6 Does the project design engineering reflect current good practices?	/1/	DR I	Checking the technical specifications of the bio-digester, boiler, biogas burner and steam turbine it is possible to confirm that the project design reflects current good practices. Spent-wash from the ethanol plant will be collected in two buffer tanks with a capacity of 500 m^3/d each. Two bio-digesters are installed at the project site to generate biogas, which is used to generate electricity and steam for internal use. The boiler is designed to produce steam with a capacity of 40 TPH and a steam turbine will produce steam and electricity. Excess biogas will	~~CL3~~	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			be flared. The operational lifetime of the project equipment is estimated to be 25 years. *Documented evidences related to the project's operational lifetime of new equipment shall be provided.*		
A.2.7 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?	/1/	DR I	Yes. The proposed project activity will reduce greenhouse gas emissions by installing an anaerobic wastewater treatment facility and co-generation unit. Project equipment will mainly be supplied by India.		OK
A.3 Participation requirements					
A.3.1 Do all participating Parties fulfil the participation requirements as follows:	/1/	DR	The participating Parties are the Philippines (host Party) and the Netherlands (Annex 1 Party). The Philippines ratified the Kyoto protocol on the 20 November 2003 and the DNA is the Department of Environment and Natural Resources (DENR). The Netherlands ratified the Kyoto Protocol on 31 May 2002 and the DNA is the Ministry of Infrastructure and the Environment (lenM) The project participants are Roxol Bioenergy corporation (Roxol), The International Bank for Reconstruction and Development (IBRD) as trustee of the CDCF and the DNA of the Netherlands. The project participants are listed in Section A.3 of the PDD and the information is consistent with the contact details provided in Annex 1 of the PDD.		OK
A.3.2 Do the letters of approval meet the following requirements?	/1/	DR	*The Letters of Approval for both participating Parties are yet to be obtained.*	~~CAR1~~	OK
A.3.3 Have all private/public project participants been authorized by an involved Party?	/1/	DR	*A formal letter of confirmation regarding the voluntary participation by the DNA of both Parties The Philippines and The Netherlands is*	~~CAR 1~~	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			yet to be obtained.		
A.4 Technical description of the project activity					
A.4.1 Is the project's location clearly defined?	/1/	DR	The project is located in La Carlota City, Negros Occidental Province. The coordinates of the project location are 10° 24' 0'' North and 122° 56' 0'' East, clearly specifying the project site.		OK
A.5 Public funding of the project activity					
A.5.1 In case 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 result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties?	/1/	DR I	The project does not involve any public funding from an Annex I Party but is financed through internal funding from the Roxas Holdings Inc. The validation did not reveal any information that indicated that the project can be seen as a diversion of official development assistance (ODA) funding towards the Philippines. This has also been confirmed with the DNA of the Philippines.		OK
B Application of a baseline and monitoring methodology					
B.1 Methodology applied					
B.1.1 Does the project apply an approved methodology and the correct version thereof?	/1/	DR	Yes. The proposed project activity applies the approved baseline methodology ACM0014 Version 3.1 'Mitigation of greenhouse gas emissions from treatment of industrial wastewater', for sectoral scope 13 'waste handling and disposal'.		OK
B.2 Applicability of methodology (and tools)					
B.2.1 How was it validated that the project complies with the following applicability criteria: The methodology is applicable to project activities that aim at reducing methane emissions from industrial wastewater treatment.	/1/	DR I	It was confirmed during the site visit that the project aims at reducing methane emissions by installing a wastewater treatment system in an industrial facility.		OK
B.2.2 How was it validated that the project complies with the following applicability criteria: In the baseline, the	/1/	DR I	The project is a greenfield project and in the baseline, the wastewater from the ethanol plant	~~CL4~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
wastewater is not treated, but directed to open lagoons that have clearly anaerobic conditions.			would have been directed to open lagoons. Different design options have been identified for the open lagoons, with an average depth of 3, 5 or 6 m and thus clearly anaerobic conditions. This was confirmed by the baseline design report and during the site visit. *The baseline design report has been provided to DNV however, the document does not reflect the name of the entity issuing the report and the date of issuance. This has to be provided.*		
B.2.3 How was it validated that the project complies with the following applicability criteria: In the project activity, the wastewater 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.	/1/	DR I	It is confirmed that the project is designed to treat wastewater in new an-aerobic digesters. The extracted biogas is directed to a co-generation facility and will only be flared when the plant is not in operation during maintenance and shutdowns. Residual sludge from the anaerobic digester will be dried in an evaporator (de-watering facility) and used as fuel for the boiler.		OK
B.2.4 How was it validated that the project complies with the following applicability criteria: The average depth of the open lagoons in the baseline scenario is at least 1 m.	/1/	DR I	Different design options have been identified for the open lagoons. By verifying the baseline design report, the average depth of the lagoons would have been 3, 5 or 6 m. *The baseline design report has been provided to DNV however, the document does not reflect the name of the entity issuing the report and the date of issuance. This has to be provided.*	~~CL4~~	OK
B.2.5 How was it validated that the project complies with the following applicability criteria: Heat and electricity requirements per unit input of the water treatment facility remain largely unchanged in the baseline scenario and the project activity.	/1/	DR	In the baseline, wastewater will be directed to open lagoons which results in no heat and electricity requirements per unit input of the wastewater treatment facility. *Heat and electricity requirements per unit input of the water treatment facility in the baseline and*	~~CL5~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			project activity needs to be clarified.		
B.2.6 How was it validated that the project complies with the following applicability criteria: Data requirements as laid out in this methodology are fulfilled.	/1/	DR	*Pending upon conclusion on B.2.5 and B.2.7.*	~~CL5~~	OK
B.2.7 How was it validated that the project complies with the following applicability criteria: The residence time of the organic matter in the open lagoon system should be at least 30 days.	/1/	DR	*The residence time of the organic matter in the open lagoon system needs to be justified and substantiated with evidence.*	~~CL5~~	OK
B.2.8 How was it validated that the project complies with the following applicability criteria: Local regulations do not prevent discharge of wastewater in open lagoons.	/1/	DR I	There is no regulation in the host country that prevents the discharge of wastewater in open lagoons. Furthermore, the use of open lagoons is still considered common practise in the Philippines. This has been confirmed with local authorities during the site visit.		OK
B.2.9 Is the selected baseline one of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/	DR	*Pending upon conclusion on B.2.2 to B.2.7.*	~~CL4~~ ~~CL5~~	OK
B.3 Project boundary					
B.3.1 What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined and in accordance with the methodology?	/1/	DR	Yes. The project system boundary is in line with the approved CDM methodology ACM0014 version 3.1. The spatial extent of the project boundary includes the site where the wastewater is treated in both the baseline and project scenario. The equipment included in the project boundary is the bio-digester, the co-generation facility, the flaring system and the dewatering facility (evaporator) installed at the project site.		OK
B.3.2 Which GHG sources are identified for the project? Does the identified boundary cover all possible sources linked to the project activity? Give reference to documents considered to arrive at this conclusion.	/1/	DR	**Baseline emissions:** - CH_4 emissions from wastewater treatment process or sludge disposal;	~~CL 6~~	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			- CO_2 emissions from electricity consumption/generation; - CO_2 emissions from thermal energy generation. **Project emissions:** - CH_4/N_2O emissions from wastewater treatment process or sludge treatment: (i) treatment of effluent from the anaerobic digester (CH_4) is not accounted under the project activity, since effluent will not be directed to open lagoons; (ii) physical leakage of methane from the digester system is accounted for; (iii) methane emissions from flaring are accounted for; (iv) methane and nitrous oxide emissions from land application of sludge are not accounted for; - CO_2 emissions from on-site electricity use: not accounted for since electricity will be produced by the project activity; - *CO_2 emissions from on-site fossil fuel consumption: A discussion needs to be included in the PDD (i.e. missing in section B.6.1 of the PDD, page 26).* *The table in section B.3 should clearly indicate which GHG sources are accounted for or neglected within the project boundary. For baseline emissions, the sludge disposal and electricity consumed from / sold to the grid need to be discussed.* No leakage emissions are accounted for which is in line with the approved methodology.		
B.3.3 Does the project involve other emissions sources not	/1/	DR	All project emission sources are foreseen by the		OK

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foreseen by the methodologies that may question the applicability of the methodology? Do these sources contribute with more than 1% of the estimated emission reductions of the project?			methodology.		
B.4 Baseline scenario determination					
B.4.1 Which baseline scenarios have been identified? Is the list of baseline scenarios complete?	/1/	DR	In line with the approved baseline methodology ACM0014 the following baseline scenarios have been discussed: For **wastewater treatment** component: - W1. The use of open lagoons for the treatment of wastewater; - W2. Direct release of wastewater to a nearby water body; - W3. Aerobic wastewater treatment facilities; - W4. Anaerobic digester with methane recovery and flaring; - W5. Anaerobic digester with methane recovery and utilization for electricity or heat generation (the project) without being developed as a CDM project. For **electricity generation** component: - E1. Power generation using fossil fuels in a captive power plant. - E2. Electricity generation in the grid. - E3. Electricity generation using renewable sources. For **heat generation** component: - 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	~~CAR 2~~ ~~CAR 3~~	OK

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			sources. *The list of identified baseline scenarios shall include and discuss the option of generation of electricity and heat using biogas and energy, being sold to potential nearby off-takers.*		
B.4.2 How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/	DR I	*Step 3 of the methodology refers to step 3 of the additionality tool for the elimination of alternatives that face prohibitive barriers. This needs to be addressed.* W1. Plausible scenario. Scenario W1 was determined in a step wise approach: a) several lagoon design options have been defined, taking into consideration local conditions and design specifications; b) an economic assessment has been carried out and the least cost option has been selected; c) the average depth of the baseline lagoon design has been verified based on literature, establishing an average lagoon depth for the particular industry; step d) not applicable. *Evidence for step 1c) has to be provided. In defining scenario W1, (i) further explanation is requested on how the assumptions in section B.4.2 are derived and (ii) step c and d need to be explained in more detail.* W2. As per the clean water act, effluent needs to be treated before it can be released into nearby water bodies. Thus, this alternative does not comply with environmental legislation in the host country and has been eliminated, which is deemed appropriate. *W3. It is stated that applying aerobic wastewater treatment to systems with high organic content,*	~~CAR 2~~ ~~CAR 3~~ ~~CL 8~~	OK

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			electricity cost for forced aeration will be very high and thus, this option is not financially viable. Further evidence to substantiate this statement needs to be provided. W4. It is not mandated by law to install an-aerobic digester with methane recovery and flaring, which has been confirmed during the site visit. *It is furthermore stated that financial barriers might occur since there are no revenues related to this alternative. In this context, (i) potential off-takers of heat and/or electricity in the proximity of the project need to be elaborated and (ii) further evidence needs to be provided with regard to the technological barriers and uncertainties.* *W5. Same as W4 above.* *E1. The statement in the PDD 'It is economically more attractive to purchase electricity from the grid. The electricity price per unit decreased as the demand more electricity increases' needs to be explained further and evidence is requested to substantiate this statement.* E2. Plausible scenario. E3. The supply of biomass underlies seasonal fluctuations and is thus not available year around. Electricity from other renewable energy sources such as wind or solar power involves high investment cost and is also seasonal. Due to these uncertainty factors, renewable power generation is not an option. *Evidence is requested for the seasonal fluctuation in the supply of biomass.* H1. *Further evidence needs to be provided with regard to the technological barriers/risks and*		

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			uncertainties. H2. Plausible scenario. H3. The supply of biomass underlies seasonal fluctuations and is thus not available year around. Electricity from other renewable energy sources such as wind or solar power involves high investment cost and is also seasonal. Due to these uncertainty factors, renewable power generation is not an option. *Evidence is requested for the seasonal fluctuation in the supply of biomass.* *The remaining alternatives are inconsistently stated in the PDD. This needs to be updated.*		
B.4.3 What is the baseline scenario?	/1/	DR	*Pending (see B.4.1 and B.4.2)*	~~CAR 2~~ ~~CAR 3~~ ~~CL 8~~	OK
B.4.4 Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/	DR	*Pending (see B.4.1 and B.4.2)*	~~CAR 2~~ ~~CAR 3~~ ~~CL 8~~	OK
B.4.5 Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	*Pending (see B.4.1 and B.4.2)*	~~CAR 2~~ ~~CAR 3~~ ~~CL 8~~	OK
B.4.6 Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR	Yes. The baseline scenario sufficiently takes into account the following regulations: - Republic act No. 9275 – Philippines Clean Water Act of 2004, adopting the effluent standards of DENR DAO 35-1990; - DENR: Administrative Order No. 34, Series of 1990; - DENR: Administrative Order No. 35, Series of 1990;		OK

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			- The Philippines: Republic Act No. 9136, Reforms in the public power industry; - Rule No. 19.6 of the RA 9275; - DENR DAO No. 10 Series of 2005.		
B.4.7 Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	Though the baseline scenario determination is in line with available data, clear references have not been provided in the PDD.	~~CAR 2~~ ~~CAR 3~~	OK
B.4.8 Is the baseline determination adequately documented in the PDD? • All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. • All documentation is relevant as well as correctly quoted and interpreted. • Assumptions and data can be deemed reasonable • Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. • The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/1/	DR	The following has been verified from site visit: - Assumptions and data used in the PDD have not been properly referenced and justified; - Documentation has not been correctly quoted and interpreted; - Assumptions and data have not been transparently justified; - Relevant national and sectoral policies are considered and listed in the PDD; - Though the methodology has been correctly applied to identify what would occur in the absence of the project, further evidence with regard to the assumptions made to determine the baseline scenario is requested as in B.4.2, B.4.3, B.4.4 and B.4.5.	~~CAR 2~~ ~~CAR 3~~	OK
B.5 Additionality determination.					
B.5.1 What approach/tool does the project use to assess additionality? Is this in line with the methodology?	/1/	DR	As required by the methodology ACM0014, the project applies the latest version of the 'tool for the demonstration and assessment of additionality' version 6.1.0.		OK
B.5.2 Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/	DR I	Yes. The baseline scenario sufficiently takes into account the following regulations: - Republic act No. 9275 – Philippines Clean Water Act of 2004, adopting the		OK

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			effluent standards of DENR DAO 35-1990; - Rule No. 19.6 of the RA 9275; - DENR DAO No. 10 Series of 2005.		
B.5.3 Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	Yes. Sufficient evidence has been provided to support the relevance of the arguments made.		OK
B.5.4 What is the project additionality mainly based on (Investment analysis or barrier analysis)?	/1/	DR	To demonstrate the project additionality the project participants applied an investment analysis.		OK
Prior consideration of CDM					
B.5.5 What is the evidence for serious consideration of CDM prior to the time of decision to proceed with the project activity?	/1/	DR	A project idea note (PIN) was submitted to the World Bank on 21 March 2007 and further evidence for prior consideration of CDM has been provided in form of an e-mail conversation between the project participant and the World Bank, dated 1 May 2007. A request for revision of the approved consolidated baseline methodology ACM0014 to include greenfield projects has been submitted to the secretariat on 12 January 2008. Relevant evidence has been verified by DNV. *This however does not sufficiently demonstrate that CDM has been seriously considered prior to the decision to proceed with the project activity. Therefore, further evidence for the internal decision by the project owner is requested to demonstrate that CDM has indeed been seriously considered before proceeding with the project.*	~~CL 7~~	OK
B.5.6 If the starting date is after 2 August 2008 and before the global stakeholder consultation, has the DNA and UNFCCC confirmed that the project participants have informed in writing of the project's intention to seek CDM	/1/	DR	The project starting date is before 2 August 2008. Thus, it is not required to inform the DNA and UNFCCC in writing about the project's intention to seek CDM status.		OK

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status?			However, a letter of intention to seek CDM status for the proposed project activity has been submitted to the UNFCCC by the project participant on 15 September 2008.		
Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)					
B.5.7 What initiatives where taken by the project participants from the starting date of the project activity to the start of validation in parallel with the physical implementation of the project activity?	/1/	DR	The project participants signed an ERPA for the project activity on 14 January 2009. Furthermore, the contract with the validating DOE was signed in December 2009 and the PDD was web-hosted for GSC in February 2010.		OK
B.5.8 When did the construction of the project activity start?	/1/	DR I	*The actual start of construction needs to be clarified and the date shall be included in the PDD.*	~~CL 1~~	OK
B.5.9 When was the project commissioned?	/1/	DR I	*At the time of writing, the project has not been commissioned yet. This information needs to be included in the PDD.*	~~CL 1~~	OK
B.5.10 Does the timeline of the project confirm that continuous actions in parallel with the implementation were taken to secure CDM status?	/1/	DR I	Though it has been sufficiently demonstrated that continuous actions were undertaken to secure CDM status in parallel with its implementation, B.5.8 and B.5.9 need to be included in the timeline.	~~CL 7~~	OK
Investment analysis					
B.5.11 Does the project activity or any of the remaining alternatives generate revenues apart from CDM? Is this reflected in the PDD?	/1/	DR	The project activity is to produce biogas using bio-digestion and the generation of heat and electricity for internal use. *Further clarification with regard to the remaining baseline alternatives is requested.*	~~CAR 2~~ ~~CAR 3~~	OK
B.5.12 Do any of the alternatives to the project activity involve investment? Is this reflected in the PDD?	/1/	DR	The baseline alternatives to the project have been identified as (i) the use of open lagoons for the treatment of wastewater; (ii) electricity	~~CAR 2~~ ~~CAR 3~~	OK

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			generation in the grid and (iii) heat generation using fossil fuels in a boiler. None of these alternatives involve investment. *However, further clarification with regard to the remaining alternatives is requested.*		
B.5.13 Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/	DR	A simple cost analysis was carried out for the project activity. *The choice of financial analysis is not reasonable. Since the project activity will result in cost savings for operating the ethanol plant, the investment analysis has to be revised (i.e. benchmark analysis).* *Performing an investment analysis, it has to be demonstrated that input parameters are valid and available at the time of decision to proceed with the project activity.*	~~CAR 4~~	OK
B.5.14 Is the benchmark/discount rate the latest available at the time of decision?	/1/	DR	*Pending. See B.5.13.* *It has to be demonstrated that the data used was available and valid at the time of investment decision.*	~~CAR 4~~ ~~CL 9~~	OK
B.5.15 What is the financial indicator? Is it on equity/project basis? Before/after tax? Is the financial indicator in correspondence with the benchmark?	/1/	DR	*Pending. See B.5.13.*	~~CAR 4~~	OK
B.5.16 Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered to have zero value?	/1/	DR	Yes. Underlying assumptions are appropriate.		OK
B.5.17 Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with normal accounting practice in the host country?	/1/	DR	*Pending. See B.5.13.*	~~CAR 4~~	OK
B.5.18 Is the time period of the investment analysis and operating time of the project realistic? Has salvage	/1/	DR	*Pending. See B.5.13.*	~~CAR 4~~	OK

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	value been taken into account? Is working capital returned in the last year of operation?					
B.5.19	When a feasibility study report or similar approved by the government is used as the basis for the investment analysis: Can it be confirmed that the values used in the PDD are fully consistent with the FSR and is the period of time between finalization of the FSR and the investment decision adequate?	/1/	DR	*Pending. See B.5.13.*	~~CAR 4~~	OK
B.5.20	How was the amount of output (e.g. sales of electricity) assessed? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM version 1 paragraph 95.	/1/	DR	☐ The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval ☐ The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company) ☒ Other approach. *Pending. See B.5.13.*	~~CAR 4~~	OK
B.5.21	How was the output price (e.g. electricity price) assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM version 1 paragraph 95.	/1/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants *Provide details on how the output price was validated:* *Pending. See B.5.13.* *It has to be demonstrated that the data used was available and valid at the time of investment decision.*	~~CAR 4~~ ~~CL 9~~	OK
B.5.22	How were the investment costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and	/1/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public	~~CL 9~~	OK

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	list all the projects that have been used for cross-checking in accordance with VVM version 1 paragraph 95.			announcements and annual financial reports related to the project and the project participants *Provide details on how the investment costs were validated:* *The data source for the investment cost needs to be clarified and clearly indicated in the PDD. It has to be demonstrated that the data was available and valid at the time of investment decision.*		
B.5.23	How were the O&M costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM version 1 paragraph 95.	/1/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants *Provide details on how the O&M costs were validated:* *The data source for the O&M cost needs to be clarified and clearly indicated in the PDD. It has to be demonstrated that the data was available and valid at the time of investment decision.*	~~CL 9~~	OK
B.5.24	Describe the assessment of the other input parameters. Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM version 1 paragraph 95.	/1/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants *Provide details on how other input parameters in the financial analysis were validated.*	~~CL 9~~	OK
B.5.25	Was the financial calculation spreadsheet verified and found to be correct?	/1/	DR	*A reproducible financial calculation spreadsheet has to be provided, including a sensitivity analysis.*	~~CAR 4~~	OK
B.5.26	Sensitivity analysis: Have the key parameters contributing to more than 20% of the revenue/costs	/1/	DR	*A revised sensitivity analysis has to be provided, including key parameters contributing to more*	~~CAR 4~~	OK

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	during operating or implementation been identified? Has possible correlation between the parameters been considered?			*than 20% of the revenue/cost during operation or implementation.*		
B.5.27	Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/	DR	*It needs to be shown at which variation for each parameter the IRR will be able to cross the benchmark. Also, the project proponent needs to substantiate the likelihood of such level of variation would occur*	~~CAR 4~~	OK
B.5.28	Have the key parameters been varied to reach the benchmark and the likelihood of this to happen been justified to be small?	/1/	DR	*Pending. See B.27.*	~~CAR 4~~	OK
Barrier analysis						
B.5.29	Are the barriers identified complimentary to a potential investment analysis? Does the barrier have a clear impact on the financial returns so that it can be assessed in an investment analysis? Each barrier is discussed separately.	/1/	DR	N/A. To demonstrate the project's additionality the project participants applied the investment analysis.		N/A
B.5.30	How were the investment barriers assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/1/	DR	N/A		N/A
B.5.31	How does CDM alleviate the investment barriers?	/1/	DR	N/A		N/A
B.5.32	Is the project activity prevented by the investment barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	N/A		N/A
B.5.33	How were the technological barriers assessed to be real? Are the technological barriers substantiated by a source independent of the project participants?	/1/	DR	N/A		N/A
B.5.34	How does CDM alleviate the technological barriers?	/1/	DR	N/A		N/A
B.5.35	Is the project activity prevented by the technological barriers and at least one of the possible alternatives	/1/	DR	N/A		N/A

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to the project activity is feasible under the same circumstances?					
B.5.36 How were the barriers due to prevailing practise assessed to be real? Are the barriers due to prevailing practise substantiated by a source independent of the project participants?	/1/	DR	N/A		N/A
B.5.37 How does CDM alleviate the barriers due to prevailing practise?	/1/	DR	N/A		N/A
B.5.38 Is the project activity prevented by the barriers due to prevailing practise and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	N/A		N/A
B.5.39 How were the other barriers assessed to be real? Are the other barriers substantiated by a source independent of the project participants?	/1/	DR	N/A		N/A
B.5.40 How does CDM alleviate the other barriers?	/1/	DR	N/A		N/A
B.5.41 Is the project activity prevented by the other barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	N/A		N/A
Common practice analysis					
B.5.42 What is the geographical scope of the common practice analysis? Is this justified?	/1/	DR	The geographical scope of the common practise analysis is the Philippines. This is justified.		OK
B.5.43 What is the scope of technology and size (e.g. capacity of power plant) for the common practice analysis and how has this been justified?	/1/	DR	*Further describe why the scope of the common practise analysis is specifically related to wastewater utilization resulting from ethanol plants and not to anaerobic treatment of wastewater (using the same technology as the project) with a comparable composition.*	~~CL 9~~	OK
B.5.44 What is the data source(s) used for the common practice analysis?	/1/	DR	*Data sources used in the common practise analysis need to be provided.*	~~CL 10~~	OK

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B.5.45 How many similar non-CDM-projects exist in the region within the scope?	/1/	DR	*The scope of technology and size needs to be described in more detail.* *The PDD states that there is only one ethanol plant not developed under the CDM. The source for this statement needs to be provided, and also how this project was implemented without CDM revenue.*	~~CL 10~~	OK
B.5.46 How were possible essential distinctions between the project activity and similar activities assessed?	/1/	DR	*See B.5.43 to B.5.45.*	~~CL 10~~	OK
B.5.47 What is the conclusion of the common practice analysis?	/1/	DR	*Pending from the resolution of the previous CL.*	~~CL 10~~	OK
Conclusion					
B.5.48 What is the conclusion with regard to the additionality of the project activity?	/1/	DR	*Pending from the resolution of the previous CARs and CLs.*	~~CAR 2~~ ~~CAR 3~~ ~~CL 9~~ ~~CL 10~~	OK
B.6 Calculations of GHG emission reductions					
Data and parameters that are available at validation and that are not monitored					
B.6.1 How was the inflow/outflow COD and the COD removal rate of the wastewater treatment plant verified?	/1/	DR	The project is implemented as a greenfield project and no measurement data for the chemical oxygen demand is available. Thus, the designed COD inflow of 130 000 mg/l (COD_{in}) has been used for ER calculation. The effluent COD of 187 t COD/yr (COD_{out}) has been calculated based on the COD inflow and COD removal rate of 99.52%. *The data source for the COD_{in}, COD_{out} and COD removal rate should be clearly referenced in the calculation spreadsheet and in the PDD and evidence has to be provided. Values should be*	~~CL 11~~	OK

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			consistent throughout documentation.		
B.6.2 How was the maximum methane production capacity verified?	/1/	DR	B_o has been selected as a conservative assumption as outlined in the approved baseline methodology. A value of 0.21 t CH_4/tCOD is used which is deemed conservative.		OK
B.6.3 How was the factor expressing the influence of the depth of the lagoon on methane generation verified?	/1/	DR	The factor (0.7) is based on the average depth of the lagoon, which is recommended to be 6 m according to option 3 of the baseline lagoon design report. *The depth of open lagoons is inconsistently stated in the project documentation.* *As per the methodology, the least cost lagoon design option needs to be defined. If several options with comparably low cost exist, the lowest lagoon depth should be chosen. This needs to be clarified.*	~~CL 11~~	OK
B.6.4 How was the average depth of lagoon verified?	/1/	DR	*The average depth of the lagoon has been verified against the baseline lagoon design report.* *Further clarification is requested. See B.6.3.*	~~CL 11~~	OK
B.6.5 How was the annual quantity of electricity that would be consumed in the absence of the project activity verified?	/1/	DR I	Electricity that would be consumed in the absence of the project is considered to be zero, since without the project, wastewater would be treated in anaerobic lagoons where wastewater is passes the lagoons by gravity. This has been verified with the baseline lagoon design report. OK.		OK
B.6.6 How was the grid emission factor/baseline emission factor verified?	/1/	DR	The EF has been calculated *ex-ante* as per the simple OM method described in the tool to calculate the emission factor for an electricity system. To verify that the most recent data has been selected that was available at the time of	~~CL 12~~	OK

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			web-hosting the PDD in February 2010, it is requested to: *Provide source and evidence for the raw data used to calculate the grid EF and demonstrate that at the time of web-hosting the PDD, no vintage data is available for the year 2009.* *For OM calculation:* *The simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. This needs to be demonstrated.* *It is also not demonstrated transparently, which option (A or B) is used in the simple OM emission factor calculation.* *For BM calculation:* *It needs to be demonstrated transparently that the power plants listed and contributing to more than 20% of grid generation are the ones built most recently.* *BM calculation should be based on the latest year for which data is available.*		
B.6.7 How was the CO_2 factor of the fossil fuel type used in the captive power plant verified?	/1/	DR	*Where IPCC default values are used, it needs to be confirmed that no local or regional date is available.*	~~CL 11~~	OK
B.6.8 How was the efficiency of the boiler that would be used for heat generation in the absence of the project verified?	/1/	DR	The boiler efficiency (70%) has been selected based on the specification of the proposed boiler for the system in the feasibility study report. *The CO_2 factor has been selected for the fossil fuel type used in the captive power plant whereas the efficiency of the boiler has been selected for*	~~CL 11~~	OK

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			heat generation in the absence of the project. This needs to be clarified.		
B.6.9 How was the fraction of biogas that leaks from the digester verified?	/1/	DR	The value of 0.05 m^3 biogas leaked/ m^3 biogas has been selected as per IPCC 2006 Guidelines, Volume 5, Chapter 4; Page 4.4.		OK
B.6.10 How was the surface of the lagoon verified?	/1/	DR	*The surface area of the lagoon needs to be clarified. It is indicated that the surface area is selected according to option 2 whereas the depth of the lagoon is as per option 3 outlined in the baseline lagoon design report.*	~~CL 11~~	OK
Baseline emissions					
B.6.11 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Baseline emissions have been calculated as per the approved CDM methodology ACM0014 version 3.1. They are calculated as: (i) methane emissions from the anaerobic treatment of wastewater in open lagoons (calculated applying the methane conversion factor method); (ii) emissions from generation and/or consumption of electricity; and (iii) emissions from the generation of heat. *For (i): The following evidence has to be provided and/or inconsistencies occur in the project documentation: Surface area of lagoons; inflow and effluent COD, COD removal rate, average monthly temperature, operation date of the plant. This needs to be clarified.* For (ii): In the baseline, wastewater is directed to open lagoons by gravity and thus, the electricity consumption in the baseline is zero. For electricity generation, emissions are calculated based on the steam turbine operation (4 MW) times the grid emission factor.	~~CL 11~~ ~~CL12~~ ~~CL13~~	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			For power generation, explain the assumptions that the steam turbine is operated 330 d/yr. Furthermore, the following statement needs to be explained: 'since Biomass is 40% of the fuel that supply the boiler, therefore the baseline emission only take into account 60% or electricity generate from biogas'. *Further clarification on the grid emission factor is requested as in B.6.6.* For (iii): the amount of heat generation is calculated as the net quantity of heat generated in the new anaerobic digester times the CO_2 emission factor of the fossil fuel type used in the boiler and the efficiency of the boiler that would be used for heat generation in the absence of the project activity. *Explain the data source for the constant value for steam at 8 bar.*		
B.6.12 Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	*See B.6.11.*	~~CL 11~~ ~~CL12~~ ~~CL13~~	OK
B.6.13 Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	*See B.6.11.*	~~CL 11~~ ~~CL12~~ ~~CL13~~	OK
Project emissions					
B.6.14 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Project emissions have been calculated as per the approved CDM methodology ACM0014 version 3.1. According to the methodology project emissions result from (i) the physical leakage of methane from the anaerobic digester and from (ii) flaring of biogas generated in the anaerobic digester.	~~CAR 5~~ ~~CL 14~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.

			For (i): The physical leakage of the digester will be calculated by using a default value of 0.05 for the fraction of biogas that leaks in the outlet of the new digester. The methane concentration is assumed to be 55%.
			For (ii): The 'tool to determine project emissions from flaring gases containing methane' has been applied. The flare will be operated only during maintenance and in emergency cases; therefore the amount of biogas sent to the flare equals the amount of biogas collected in the outlet of the digester. For ex-ante estimations the flare operation is estimated to be 20 days and the flare efficiency is considered to be 50% (open flare). Evidence for the flare operation has been provided.
			The data source for the amount of biogas collected in the outlet of the digester needs to be clarified.
			The assumption of 55% methane concentration needs to be explained in further detail.
			Also, the type of flaring system needs to be consistently stated in the PDD and the flare operation as well as flare efficiency needs to be included in the monitoring plan.
			The following project emissions are considered to be zero:
			- Emissions from the treatment of wastewater effluent from the anaerobic digester; effluent will not be directed to anaerobic lagoons or a de-watering facility: effluent will not be directed to open lagoons but to a de-watering facility (evaporator/dryer).		

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			- Emissions from land application of sludge; - Emissions from electricity/fossil fuel consumption: *it needs to be clarified if electricity/fossil fuel is consumed in case of emergency or during maintenance. If relevant, emissions from fossil fuel consumption need to be included in the PE calculation.* *The EIA page 26 states that a (high density poly-ethlene) lined lagoon is recommended in case raw or semi processed vinasse is temporarily detained. Clarification is requested for such emission to be considered in PE calculations.*		
B.6.15 Have conservative assumptions been used when calculating the project emissions?	/1/	DR	*See B.6.14.*	~~CAR 5 CL 14~~	OK
B.6.16 Are uncertainties in the project emission estimates properly addressed?	/1/	DR	*See B.6.14.*	~~CAR 5 CL 14~~	OK
Leakage					
B.6.17 Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	No leakage emissions are accounted for. This is in line with the methodology.		OK
B.6.18 Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	N/A		OK
B.6.19 Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	N/A		OK
Emission Reductions					
B.6.20 Algorithms and/or formulae used to determine emission reductions: • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced.	/1/	DR	*Pending from the resolution of the previous CAR and CLs.*	~~CAR 5 CL12 CL13 CL 14~~	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
• All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity. • The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.					
B.7 Monitoring plan					
Data and parameters monitored					
B.7.1 Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/	DR	Yes. The monitoring plan is in accordance with the requirements outlined in the approved monitoring methodology ACM0014 version 3.1.		OK
B.7.2 Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/	DR	*The monitoring plan should include a description of the following parameters:* - *Days of operation of the system;* - *Flare efficiency and flare operation.*	~~CL 15~~	OK
B.7.3 In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR	A flow meter will be used to monitor the following parameters: (i) quantity of wastewater treated in the anaerobic digester; (ii) quantity of effluent from the digester and (iii) quantity of effluent from the dewatering facility. A gas flow meter will be used to monitor (i) the amount of biogas collected from the new digester and (ii) the amount of biogas sent to the flare. A portable gas meter will be used to monitor the concentration of methane in the biogas at the outlet of the bio-digester. An electricity meter will be used to monitor the net quantity of electricity generated using biogas from the new anaerobic digester. A flow meter will be used to monitor the net	~~CL 15~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			quantity of heat generated by using biogas. The average temperature at the project site will be determined by collecting daily mean, minimum and maximum temperature readings from the Philippines Meteorological Department. *Include in the monitoring plan if the flow rate of the residual gas is measured on a dry or wet basis.* *The measurement equipment/method is not clearly described for each parameter.*		
B.7.4 In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR	The accuracy of meter readings for (i) the net quantity of electricity generated and (ii) net quantity of heat will be cross-checked with receipts issued by the purchasing power company. *The measurement accuracy is not described for all relevant parameters.*	~~CL 15~~	OK
B.7.5 In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant parameter.	/1/	DR	Yes. Requirements for maintenance and calibration are sufficiently described in the PDD. Calibration and maintenance will be carried out in line with industry standards and manufacturer specifications were applicable. This is defined for the following measurement equipments: (i) wastewater/effluent flow meters; (ii) electricity output meter; (iii) steam output meter and (iv) gas flow meters.		OK
B.7.6 Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.		DR	Continuous monitoring is performed for the following parameters: (i) quantity of wastewater treated in the anaerobic digester; (ii) net quantity of electricity generated with biogas; (iii) quantity of effluent from the digester and effluent from the dewatering facility; (iv) amount of biogas	~~CL 15~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			collected from the digester; (v) amount of biogas sent to flare and (vi) the temperature of the flare. Daily monitoring is performed for (i) the average COD in the effluent entering the digester and (ii) the average temperature at the project site. The concentration of methane in the biogas in the outlet of the digester will be monitored quarterly on a 95% confidence level. *The measurement frequency needs to be specified for each parameter included in the monitoring plan.*		
B.7.7 Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	*The recording frequency needs to be specified for each parameter included in the monitoring plan.*	~~CL 15~~	OK
Ability of project participants to implement monitoring plan					
B.7.8 How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/	DR I	During the site visit DNV checked the company's infrastructure and interviewed the responsible monitoring people. DNV considers the monitoring plan feasible.		OK
B.7.9 Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)?	/1/	DR	Monitored data will be aggregated monthly and/or annually and data will be archived on paper and/or electronically as relevant. Data will be recorded by using a collection template for each parameter and responsibilities for record handling have been defined in the monitoring plan. *However, no clear procedures for day-to-day record handling have been described in the PDD and procedures need to be in place at verification.*	~~CL 16~~	OK
B.7.10 Are the data management and quality assurance and quality control procedures sufficient to ensure that	/1/	DR	*Procedures for data management and quality assurance are not sufficiently described in the*	~~CL 16~~	OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
the emission reductions achieved by/resulting from the project can be reported ex post and verified?			*PDD (i.e. procedures for training of monitoring personnel, procedures for emergency preparedness for cases where emergencies can cause unintended emissions, procedures to identify corrective actions in order to provide for more accurate future monitoring and reporting, etc.).*		
B.7.11 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?	/1/	DR	Yes. All monitored data will be kept for two years after the crediting period.		OK
Monitoring of sustainable development indicators/ environmental impacts					
B.7.12 Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR I	The approved methodology ACM0014 does not account for the monitoring of sustainable development indicators. During the site visit, the DNA has noted that there is a need to have a supplemental policy to monitor the Sustainable development (SD) of a project. Currently, however, only pilot testing is performed and thus, the monitoring of SDI is not required for the project activity.		OK
B.7.13 Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	N/A		OK
B.7.14 Are the sustainable development indicators in line with stated national priorities in the host country?	/1/	DR	N/A		OK
C Duration of the project activity / crediting period					
C.1.1 Start date of project activity					
C.1.2 How has the starting date of the project activity been determined? What are the dates of the first contracts for the	/1/	DR	The starting date is the 27 June 2008, which is the date when the construction contract was signed.	~~CL 1~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
project activity? When was the first construction activity?			*It is claimed during site visit that turn-key contract has been signed with KBK Chem-Engineering Pvt Ltd (dated 27 June 2008). Evidence of the scope of work is requested, to confirm that if there is prior civil construction contract if there is any, is not earlier than 27 June 2008. This is in accordance with the "Glossary of CDM terms".* *The starting date shall be consistently stated in the PDD.* *It is unclear when the first construction activity started.*		
C.1.3 Is the stated expected operational lifetime of the project activity reasonable?	/1/	DR	The operational lifetime of the project activity is stated to be 25 years. *Documented evidences related to the project's lifetime of new equipments shall be provided.*	~~CL 3~~	OK
C.1.4 Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/1/	DR	A renewable crediting period has been selected for the project activity. The length of the first crediting period is 7 years. The starting date of the first crediting period is stated to be the 31 March 2010 or the date of registration of the project activity. This is deemed reasonable.		OK
D Environmental Impacts					
D.1.1 Are there any host country requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved? Does the approval contain any conditions that need monitoring?	/1/	DR I	Yes. An Environmental Impact Assessment (EIA) has to be conducted according to DNA requirements of the host country (DENR, Administrative Order No. 2003-30). The EIA for the project activity has been carried out by the CADP Group of Companies and was approved by the DENR through the issuance of an environmental compliance certificate (ECC) on 9 January 2010. Both documents have been		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			verified by DNV. The approval of the EIA does not contain any conditions that need monitoring.		
D.1.2 Does the project comply with environmental legislation in the host country?	/1/	DR I	Yes. The project complies with environmental legislation in the host country, which has been confirmed by the ECC of the project and with local authorities during the site visit.		OK
D.1.3 Will the project create any adverse environmental effects?	/1/	DR I	The project does not create significant environmental impacts, which has been confirmed through the EIA and the ECC, issued by the Department of Environment and Natural Resources.		OK
D.1.4 Have identified environmental impacts been addressed in the project design?	/1/	DR	Yes. Environmental impacts have been sufficiently described in the project design.		OK
D.1.5 Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/	DR	Yes. The analysis of environmental impacts has been sufficiently described in the PDD and relevant documentation has been provided.		OK
D.1.6 Are trans-boundary environmental impacts considered in the analysis?	/1/	DR	The project will not create any trans-boundary environmental impacts.		OK
E Stakeholder Comments					
E.1.1 Have relevant stakeholders been consulted?	/1/	DR I	Yes. Local stakeholders have been invited to a stakeholder consultation meeting, which was held on 30 May 2008. Invitation letters were sent to various stakeholders. A sample letter of invitation, lists of invitees and attendees as well as minutes of meeting have been provided in the Annex of the EIA. *The date for the local stakeholder meeting is inconsistently stated in the PDD and the number of stakeholders attending the meeting shall be updated.*	~~CL 17~~	OK
E.1.2 Have appropriate media been used to invite comments	/1/	DR	Local stakeholders have been invited by		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
by local stakeholders?		I	invitation letters. *However, the invitations sent to village chairmen were further cascaded to public by the local and zone leaders. This needs to be clarified in the PDD.*		
E.1.3 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?	/1/	DR I	Yes. The local stakeholder consultation has been carried out in accordance with regulations in the host country. Following a 1st level project briefing at the Environmental Management Bureau on 16 May 2008, a 2nd level public scoping with the community (the GSC) has been conducted. Furthermore, a 3rd level technical scoping has been performed by submitting the pro-forma technical scoping for evaluation to the review Committee.		OK
E.1.4 Is a summary of the stakeholder comments received provided?	/1/	DR	Yes. A summary of the comments received is included in the PDD.		OK
E.1.5 Has due account been taken of any stakeholder comments received?	/1/	DR	Due account was taken and incorporated in the Section E.2. Questions raised by the stakeholders were with regards to employment opportunities and the river pollution and odour. No adverse comments were received.		OK

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Table 3 Resolution of Corrective Action and Clarification Requests

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CAR 1 *Letter of Approval:* The Letters of Approval for both participating Parties have yet to be obtained.	A.3.2 A.3.3	Letter of approval for both Parties are provided.	Both letters of approval have been provided by the project participants. DNV does not have concerns about the authenticity thereof. However, inconsistencies were found in the letters provided with regard to project participant's name and project title. Refer to CL raised in Appendix A to this report. **CAR is closed.**
CAR 2 *Baseline determination:* 1. Step 3 of ACM0014 refers to step 3 of the Additionality tool for the elimination of scenarios that face prohibitive barriers. This needs to be addressed; 2. The list of identified baseline scenarios shall include a discussion of the following option: 'generation of biogas being sold to potential nearby off-takers'; 3. The remaining baseline alternatives are inconsistently stated in section B.4 and B.5 of the PDD. This needs to be updated.	B.4. B.5.11 B.5.12 B.5.48	1. Barriers have been further justified using documented evidences. Additional evidences are provided. Comments have been provided in the PDD in reference to scenario W5 and W1 in sections B.4 and B.5. 2. Scenario W6 (Anaerobic digester with methane recovery and production of electricity or heat generation sale to the grid (electricity) or nearby off-takers – without being developed as a CDM project.) was added to sections B.4 and B.5. **Scenario W6:** Consistent wording have been applied. **Off-taker:** A map of the area is provided (see attachment). Explanations and reference to the map have been added to section B.4 of the PDD to support that there are no potential off taker in the vicinity of the plant. 3. Inconsistencies have been corrected in	1. Prohibitive barriers have been discussed in the PDD and non-plausible scenarios have been eliminated accordingly. *2.* Scenario W6 has been included as a possible baseline scenario. It was confirmed during the site visit that the ethanol plant is located in a non-industrial area and a map of potential off-takers has been provided. 3. Alternatives in Sections B.4 and B.5 of the PDD have been revised by the project proponent. However, the methodology requires realistic combinations of scenarios for wastewater (W), electricity (E) and Heat (H) to be identified. This is not demonstrated. Refer to CAR raised in Appendix A to this report. **CAR is closed.**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		section B4 and B5. Realistic combination have been included in the relevant sections of the PDD, B.4 and B.5	
CAR 3 *Baseline determination:* Sufficient evidence has not been provided in order to support the assumptions made for selecting the baseline scenario: 1. The source: *'Von Sperling, M., C.A. de Lemos Chernicharo and F. Fernandes, 2005 Biological Wastewater Treatment in Warm Climate Regions, IWA Publishing'* has to be provided; 2. In defining scenario W1, (i) further explanation is requested on how the assumptions in section B.4. are derived and (ii) step c and d needs to be explained in more detail; 3. Evidence is requested for the seasonal fluctuation in the supply of biomass; 4. The statement in the PDD *'It is economically more attractive to purchase electricity from the grid. The electricity price per unit decreased as the demand more electricity increases'* needs to be explained further and evidence is requested.	B.4. B.5.11 B.5.12 B.5.48	1. The source: Von Sperling and al. is attached with this response. 2. Additional explanations have been provided with reference to W1. An excel sheet has been prepared by the PE providing in a transparent manner all data, calculations and assumptions. The baseline report prepared by Roxol has also been updated and is attached with this response. *Step a)* (i) Conversion factor for BOD5/COD was confirmed as 0.5 ref.: Wastewater microbiology, Third Edition, John Wiley and Sons inc., 2005, p 220, table 7.3. (Refer to PDD section B.4). (ii) No, open lagoon are designed using technical/engineering knowledge based on degradability of the effluent, local conditions, etc. It is not provided by a manufacturer. Please refer to Lagoon Baseline Report rev. 2, for details. (iii) 0.3 kg/m^3 is the technical removal rate of open lagoon (used for design). This was clarified in the PDD and evidenced by: EPA, Wastewater Technology Factsheet, Anaerobic lagoon, 2002, available at: http://www.epa.gov/owm/septic/pubs/alagoo	1. The source *'Von Sperling et al'* has been provided. It was confirmed that the average depth of an-aerobic ponds is usually 3-5 metres (see reference chapter 14). 2. The discussion of alternative scenario W1 has been described in accordance with ACM0014. *Step a)* several lagoon design options have been identified taking into account local conditions: (i) The conversion factor BOD_5/COD has been confirmed against the evidence provided. With this conversion factor, the COD_{in} of 125 000 mg/L is equivalent to a BOD_5 of 62 500 mg/L. (ii) No manufacturer data for COD_{out} is available and thus, COD_{out} has been calculated based on the influent COD to the digester (COD_{in}) and a removal efficiency of 99.52% (calculated). The removal efficiency used is more conservative than the removal efficiency of 99%, which would be necessary to meet the environmental regulations in the Philippines. (iii) The COD removal efficiency of the bio-digester system is 99.52%. (iv) The maximum volume of the lagoons

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		ns.pdf. (iv) The baseline report refers to 350,000 as well, however there was a mistake in the baseline report in relation to the effective depth. Since the effective depth is not relevant it was removed to avoid confusion. (v) Hydraulic retention time is calculated; refer to the INPUT DATA sheet. The hydraulic retention of the wastewater in the lagoon system has been calculated as 355 days and corrected throughout the PDD. (vi) All investment inputs are available at the time of the investment decision (2007). The baseline study is a summary of all information/ calculations and inputs data to comply with the methodology requirement (comparison of design options). It was compiled in one single document to facilitate the presentation at validation. Please advise if the format/presentation should be reviewed. Time of the investment decision is now stated in the PDD as 15 Nov. 2007 (ref to section B.5). This is evidenced by the certified extract of the minutes meeting held on Nov. 15 2007. (vii) All information for the state of art design of lagoons has been provided. Please take note that the adjustment factor is defined in the methodology as a factor expressing the percentage of COD that is degraded in open lagoons. It was defined as per the requirement of ACM0014 for	was confirmed against the baseline design report provided by the project participant. (v) The hydraulic retention time wastewater in the lagoon system has been calculated as 355 days. (vi) The Investment decision of 15 November 2007 has been substantiated with documented evidence. Input parameters have all been reviewed and available at the time of investment decision. (vii) As per the methodology, an adjustment factor has to be taken into account in case there would be an effluent from baseline lagoons. This is not applicable to the project activity and thus, no adjustment factor needs to be accounted for. (viii) Footnote adjustments were made in the final version of the PDD where relevant. *Step b)* The project proponent has undertaken an economic assessment of the identified options by applying a cost comparison analysis. Input parameters have been sourced from the baseline lagoon design report. (i) The lagoon design costs have been reviewed and re-evaluated and deemed appropriate. (ii) Option 3 has been selected for the baseline lagoon design, which is the alternative with the least cost as well as the lowest lagoon depth. This is in line with the methodology.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		Greenfield projects using COD inflow for COD_{in} and the design effluent COD outflow for COD_{out} – refer to excel sheet (inputs data) for calculations. (viii) Footnotes adjustment will be done at the end if judged necessary. Since the order may change we have been repeating each footnote. *Step b)* (i) All costs from step 4 have been identified and included. Costs related to labour, O&M, administrative cost, fuel costs, and interest have not been considered in the economic assessment of the lagoons because the lagoons do not require labour, maintenance and fuel cost etc. Lagoons are designed to use gravity instead of water pumps (mentioned in the PDD). It is to be noted, that labour costs associated with the excavation are included in the quotation for excavation (in the investment costs already considered). Lagoons would not generate revenue. (ii) It does not apply as the lower cost option can been identified. (iii) Explanations were added to calculations; however, the PP believes that all engineering details for baseline selection (for Greenfield) are not relevant in the PDD. Please take note that the methodology clearly states that for Greenfield projects, all assumptions should be confirmed by an independent wastewater expert.	(iii) To confirm the least cost design option, an interview with an independent wastewater expert has been undertaken by the DOE. During this interview it was confirmed that the selected baseline lagoon design option is reasonable. *Step c)* The average depth of lagoon was confirmed by the following literature sources: (i) Sperling et al., confirming an average depth of an-aerobic lagoons of 3-5 m; (ii) the US Environmental Protection Agency 2002 report; and (iii) information published on the webpage of the *'hog farm compliance assistance centre'* (last accessed on 7 June 2010). Thus, sufficient literature has been provided to verify the average depth of baseline lagoon chosen in the baseline lagoon design. *Step d)* The selected depth of 5.5 m is deemed reasonable. 3. Footnote has been corrected. 4. The statement has been removed in the revised PDD. **CAR is closed.**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		Step c) Please refer to the PDD, all steps have been completed, it was probably a formatting problem. *Step d)* The PDD was changed and depth of 5.5 m was selected. 3. Limited supply of the biomass was justified by evidence as noted in the revised PDD. The name of the document was added to the PDD Mr Jose Maria T. Zabaleta1997. Prepared for the FAO. Available at: Will the Philippines revert to its net sugar exporter status. http://www.fao.org/docrep/005/x0513e/x0513e17.htm [page access in January 2010]. 4. The statement in the PDD *'It is economically more attractive to purchase electricity from the grid. The electricity price per unit decreased as the demand more electricity increases'* has been removed.	
CAR 4 *Financial analysis:* 1. The choice of financial analysis is not reasonable. Since the project activity will result in cost savings for operating the ethanol plant, the investment analysis has to be revised (i.e. benchmark analysis); 2. A revised sensitivity analysis has to be provided, including key parameters	B.5	1. Benchmark analysis has been selected. See the revised financial analysis attached with this response. An IRR is used and sensitivity analysis was performed. 2. Sensitivity analysis is calculated in a transparent manner since all cells with formulas are accessible. It is just a matter of changing the factor (set at 1 for the base case).	1. Benchmark analysis is now used for the investment analysis, which is deemed reasonable. Further clarification is requested for the benchmark selected. 2. The sensitivity analysis has been updated in the revised PDD including a discussion about the heat and electricity variation as well as bunker fuel price. 3. The sensitivity analysis needs to be

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
contributing to more than 20% of the revenue/cost during operation or implementation; 3. It needs to be shown at which variation of each parameter the IRR will cross the benchmark. Also, the project proponent needs to substantiate the likelihood of such level of variation would occur.		3. Discussion and justification of the likeliness of this to happen has been included in the PDD.	updated by varying parameters to when the benchmark is reached. References should be included in the revised PDD for all arguments made. During validation, the PP decided to change their approach for investment analysis from benchmark analysis to investment comparison analysis. In this context, refer to CLs raised in Appendix A to this report. **CAR is closed.**
CAR 5 *Project emission calculation:* Emission from the following needs to be considered in the emission reduction calculation: 1. Electricity/fossil fuel consumption in case of emergency or during maintenance, as confirmed during the site visit. 2. The EIA page 26 states that a HDPE lined lagoon is recommended in case raw or semi processed vinasse is temporarily detained. Emission from such source needs to be considered in the project emission calculations.	B.6.14 B.6.15 B.6.16 B.6.20	1. Emissions from diesel consumption will be monitored (diesel will be used to generate electricity). Electricity and heat production have both been corrected in the PDD and spreadsheet. Please refer to energy balance excel sheet for details. 2. Occasional and unexpected emissions from the emergency lagoon have been included (monitored ex post). It is not considered ex-ante since the use of the emergency pond is unlikely.	1. Fossil fuel will be consumed in diesel gen-sets for electricity generation in case of emergency. IPCC default values used for EF_{CO2} and NCV need to consider the upper limit 95% confidence interval in accordance with the tool. 2. Potential emissions from the emergency lagoon are now included in the project. **CAR is closed.**
CL 1 *Project implementation timeline:* The planned and actual timeline with regard to the physical implementation of the project (project start up activities, basic engineering, purchase orders, start of construction, commissioning, performance testing) needs to be updated in the PDD.	A.2.2 B.5.8 B.5.9	Project implementation has been updated in the PDD. Disbursement for WWT has been done in 2009 and ERs are not expected before registration, estimated in 01/04/2011. The project commissioning date was 12/19/2009. The project construction schedule is attached (refer to implementation status.ppt). Electricity and heat generation are planned to start in Jan. 2011, it could be	The chronology of events has to be updated in the revised PDD, including all relevant milestones of implementation as well as the current status of the project. Refer to CL raised in Appendix A to this report. **CL is closed.**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		delayed, but Jan 2011 was used in the investment analysis as a conservative simplification. Time of the investment decision was identified in section B.5.	
CL 2 *Project design:* Evidence is requested and the PDD shall be updated including the following information: 1. Sludge generation and handling in the baseline/project activity; 2. Wastewater treatment in case of emergency; 3. Electricity consumption in the case of emergency/break-down of equipment; 4. The key technical parameters of the flare; 5. Information for maintenance needs of project equipment.	A.2.4	1. Under the project activity, sludge from the evaporator will be burned with bagasse (EIA P. 5-1). Short description was added to section A.4.3 of the PDD. 2. As mentioned in the EIA (P. 5-2), the slops or wastewater generated will be treated in an anaerobic digester. The emergency pond is not expected to be used at all. As the wastewater will remains in the anaerobic digester, unless there is a leak, wastewater will be drained from the digester for fixing, and then pump back to the digester for treatment. As mentioned in response to CAR5, the emergency lagoon will be only 2 m depth and water will remain in the lagoon for maximum 1.25 days as per the operational procedures put in place (refer to monitoring plan.pdf). Sludge handling under the baseline was included when comparing the alternatives design for W1 (section B.4). 3. Please refer to the ERs calculations sheet. A clarification "There will be no use of electricity from the grid, during emergency and maintenance; an on-site fossil fuel generator will be used" is provided in cell E84 of the sheet	1. A description of sludge handling in the baseline needs to be included in the revised PDD. 2. As there will be 2 bio-digesters installed at the project site, it is assumed that in the unlikely event of emergency (i.e. leak of one digester) the second digester will still be operational to process the Vinasse. The amount of wastewater that cannot be processed with one digester will be sent to the emergency pond, which is assumed to be used only for a short period of time. As the depth of the emergency pond is 2 metres, no anaerobic conditions are expected. 3. It is noted that the wastewater treatment plant will use electricity from gen-sets for start-up after maintenance/for few equipment running during shut down for regular maintenance. Project emission calculation is considering this appropriately. 4. The flare type and technical parameters are confirmed from the document provided. 5. Maintenance will be performed in accordance with appropriate industry

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		'Project Emission'. Erroneous references have been deleted in the ERs spreadsheet and corrections made in section B.6.3 It is to be noted that all consumption of FF is considered under $PE_{EC,y}$ since it is strictly associated with electricity generation and already taken into consideration under the Tool to calculate baseline, project and/or leakage emissions from electricity consumption. 4. Please refer to the document: flaring 813-RBC-TRN-040.pdf attached with the respond. Additional specifications are provided in *Flare specifications.pdf* (attached); specifications have been included in the PDD (footnote). The minimum temperature at the flare is 580 °C (auto ignition temperature of methane) and minimum flow assumed at 50% of the design capacity. 5. Refer to the monitoring plan.	standards. This has been included in the monitoring plan. Refer to CL raised in Appendix A of this report. **CL is closed.**
CL 3 *Project design:* With regard to steam production the following needs to be clarified: 1. Whether all steam produced by the boiler is fed to the steam turbine (i.e. energy balance); 2. Further explanation on the indicated 60% biogas, 40% biomass fuel mix and its composition (i.e. calculation); 3. The PDD should clearly reflect all input		1. Please refer to the energy balance in the ERs calculations sheet and the document: 7. Roxol Ethanol Plant Power Mix. The value of 9.5 kg steam/kW is not used. All the steam produced will be used in the ethanol production process. There is no excess steam. A material balance diagram, including steam production is attached for validation. (File: energy balance). 2. Please refer to the file 'energy balance'	1. Steam generated from biogas is now revised to 483 tonnes per year. All steam produced will be used in the ethanol plant; a steam balance calculation has been provided. 2. With reference to the energy balance the biogas/biomass fuel mix to the boiler remains unclear. 3. The PDD has been updated showing all inputs to the steam boiler as in Section

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
streams to the steam boiler. The project description and figures should be updated.		for details. 3. A material flow diagram is provided for reference (File: energy balance).	B.2 of the PDD. Refer to CL raised in Appendix A to this report. **CL is closed.**
CL 4 *Project design:* Documented evidence related to the project's operational lifetime of new equipment shall be provided.	A.2.6 C.1.3	Operational lifetime of 25 years is evidenced by KBK: life time 813-RBC-TRN-039 (attached with this response).	A letter issued by the technology provider (letter dated 2 April 2010) has been received through the project participants, confirming the operational lifetime of the bio-digester plant of 25 years. This is in accordance with tool to determine the remaining lifetime of equipment, version 1 (EB50). **CL is closed.**
CL 5 *Completeness of documents:* Several evidences / documents provided do not reflect the name of issuing entity and date of issuance, i.e. the FSR, Biogas Burner Details, Baseline lagoon design report, Project site power point presentation and the source Microbiology and Chemistry for Environmental Scientists and Engineers, 2nd edition. This needs to be provided.	B.2.2 B.2.4 B.2.9	Corrections have been done.	Outstanding information with regard to issuing entities and issuance date of relevant evidences has been provided. Hence, the reference list is complete. **CL is closed.**
CL 6 *Applicability of the methodology:* 1. Heat and electricity requirements per unit input of the water treatment facility in the baseline and project activity needs to be clarified; 2. The residence time of the organic matter in the open lagoon system needs to be substantiated with evidence.	B.2.5 B.2.6 B.2.7 B.2.9	1. Please refer to ERs calculations sheet. The VVM rule (1%) was used to demonstrate that the energy input remains largely unchanged. Refer to footnote in the PDD, i.e. 240 kW * 24 h/d * 300 d/y * 1/1000 * 0.5416 tCO_2e/MWh (EF for national grid) = 880 tCO_2/y which is less than 1% of the overall expected average annual emissions reductions.	1. As it has been demonstrated that the energy requirements of the project activity contribute less than 1% of expected average annual emission reductions as outlined in the VVM. Thus, it has been sufficiently demonstrated that electricity and heat requirements remain largely unchanged. 2. The baseline lagoon design report has been provided, where the hydraulic

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		2. This can only be based on calculations since it depends on the design, please refer to 8. Lagoon Design Baseline Report Rev2.	retention time is calculated to be 355 days (effective volume of the lagoons 350 000 m^3). Taking into account the design of the ethanol plant (wastewater generation of 1000 m^3/d) the residence time of the organic matter in the open lagoon is likely to exceed 30 days. **CL is closed.**
CL 7 *Project boundaries:* 1. The table in section B.3 should clearly indicate which GHG sources are accounted for or neglected within the project boundary and an explanation should be provided; 2. For baseline emissions, the sludge disposal and electricity consumed from / sold to the grid need to be discussed; 3. CO_2 emissions from on-site fossil fuel consumption: A discussion needs to be included in the PDD (i.e. missing in section B.6.1 of the PDD, page 26).	B.3.2	1. Corrections have been applied. 2. Sludge disposal is only applicable to Scenario 2 under the methodology. Electricity consumed from the grid is discussed in the project boundary. 3. On the project emissions, there is no other source of consumption of FF than for electricity generation, corrections have been made in the PDD. Project boundary has been corrected and thus, the discussion on the 1% for exclusion is not relevant.	1. Table 3 has been updated and reflects the GHG sources accounted for under the project activity. 2. Sludge is composted and applied to land in the baseline. In the project scenario, residual sludge will be burnt in the boiler alongside bagasse and biogas. Sludge disposal has not been included in the project boundary, as this would only be relevant for project activities under Scenario 2. Electricity would be imported from the grid in the baseline. PDD has been updated accordingly. 3. CO_2 emissions from fossil fuel consumption have been included in the project boundary, and considered in the project emission reduction calculation. **CL is closed.**
CL 8 *Baseline determination:* Further evidence needs to be provided with regard to the financial as well as technological barriers and uncertainties (W3, W4, W5, E1, E3, H1 and H3).	B.4.2 to B.4.5	Additional evidences have been provided to eliminate alternative scenarios in section B.4 of the PDD (attached with this response). The financial analysis has also been revised using benchmark analysis (please refer to the financial excel sheet).	*W1:* This is a plausible alternative scenario. *W2:* this scenario has been excluded as it is not in line with local regulations in the host country as demonstrated in the revised PDD. *W3:* References were updated in the revised PDD, sufficiently demonstrating that aerobic

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		Scenario W3: references have been updated; please refer to scenario W3 in PDD section B.4. Scenario W4: references have been adjusted; please refer to scenario W4 in PDD section B.4. Scenario W5: reference to investment analysis undertaken in section B.5was added. Plus additional reference to literature. A reference to step 2 of the investment analysis was added in Section B.4. Scenario W6: there are no potential off-takers in the vicinity of the plant. This was clarified in the PDD. Scenario E1: the statement on the costs comparisons is not necessary and was deleted. Scenario E3: the high capital cost is certainly representing a challenge, but in reality the biggest barrier is the simple fact that this company produce ethanol not power, thus wind or solar are simply not credible and viable options. On bagasse, the problem is the limited supply (evidence are provided). Scenario H1: revision was made. Scenario H3: this section was revised. Wind, solar for heart generation should not be mentioned in the industrial context.	wastewater treatment imposes operational problems as well as high operating costs. Aerobic treatment of wastewater from distilleries is therefore not plausible. *W4:* The option of methane recovery and flaring is only related to costs and does not create any revenue. Furthermore, methane recovery and flaring is not required by law and it was confirmed that open lagoon treatment of wastewater is still common practise in the host country. This option is therefore not plausible. W5: This option can only be excluded after the investment analysis. Reference to step 2 (investment analysis should be made in section B.4). W6: DNV is able to confirm that there are no potential off takers of heat and electricity in the vicinity of the project. *E1:* The statement has been removed from the revised PDD. *E2:* This is a plausible alternative scenario. *E3:* It is claimed that biomass is available only seasonal and therefore only suitable as additional source to generate energy. This has been substantiated with documented evidence. *H1:* Evidence has been provided that there are limited experiences with co-generation plants due to lack of availability of technology and access to financing. This option is therefore not plausible.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			H2: This is a plausible alternative scenario. *H3:* It has been demonstrated that biomass is available only seasonal and therefore only suitable as additional source to generate energy. Further clarification is requested with regard to the possible combinations of baseline scenarios as referred to in the methodology. Refer to CAR raised in Appendix A to this report. **CL is closed.**
CL 9 *Prior consideration of CDM:* Further evidence for the internal decision by the project owner is requested to demonstrate that CDM has been seriously considered before proceeding with the project activity.	B.5.5 B.5.10	Further evidences have been included in the PDD, please refer to section B.5. CDM prior consideration was substantiated, please refer to section B.5 of the PDD and file prior considerations CDM for evidences. This include original e-mail conversation dated 12 November 2007 (being requested from Jeff), minutes from the board meeting and an internal note on the PIN having made the decision to go ahead with CDM. *1. Original email is forwarded* *2. Certified extract of the minutes meeting is provided*	The e-mail conversation dated 12 November 2007 has been forwarded by the client, confirming prior consideration of CDM. Furthermore, the original minutes of the board meeting held on 15 November 2007 as well as the meeting presentation have been provided. Evidence provided confirms that CDM has been considered in the decision to proceed with the project. Internal discussion and decision making process to proceed with the project activity considering CDM revenues have been provided. **CL is closed.**
CL 10 *Project starting date:* 1. It is stated that a turn-key contract has been signed with KBK Chem-Engineering Pvt Ltd on 27 June 2008. To confirm the project starting date as per the 'Glossary of terms', further explanation and evidence for the	C.1.2	1. The project starting date is 27/06/2008, the date of the signature of the construction contract. A copy of the contract is enclosed for review of scope of work. 2. The project starting date has been corrected in throughout the PDD. There	1. The project starting date is confirmed as the 27 June 2008, which is the date the construction contract of the digester system. The validation did not reveal any information about any earlier contracts or commitments to expenditures.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
scope of work has to be provided. It needs to be clarified whether any prior civil construction contract has been signed, and, if applicable, the date of such a contract should be given. 2. The project starting date shall be consistently stated throughout documentation. 3. Evidence for the project starting date has to be provided (i.e. contract).		is no pre-civil construction contract signed. Please refer to the project schedule document. 3. The evidence is enclosed, the project schedule.	2. The project starting date of 27 June 2008 has been confirmed as the earliest date at which either the implementation, construction or real project action begins. This date has been confirmed as the earliest commitment to expenditure. 3. The annexure of the construction contract dated 27 June 2008 has been provided. **CL is closed.**
CL 11 *Investment analysis:* 1. The data source for each parameter included in the financial analysis needs to be clearly indicated in the PDD and evidence of the same has to be provided; 2. It has to be demonstrated that data was available and valid at the time of investment decision; 3. A reproducible financial calculation spreadsheet has to be provided, including a sensitivity analysis.	B.5	The time of the investment decision (15 November 2007) was clearly stated in the PDD (refer to Section B.5). This is almost the end of 2007 and thus average data for 2007 have been used. *IRR calculation:* 1. Baseline report is a summary of all data. Plus this report compare three alternative designs for the baseline lagoons with variable depth which is used to evaluate methane generation in the methodology (depends on the depth). This kind of study is not relevant to actual case, but important for emission considerations. 2. All evidences are provided. 3. Cost are justified please see notes 1, 2, 3 in excel sheet. For the O&M of equipment, the estimate was in fact revised based and represents only 5% of the total investment which is low while 10% is generally used. Electricity	Input parameters to the investment analysis are mainly taken from the FSR developed in July 2007; and are hence available at the time of investment decision in November 2007. This has been clearly stated in the PDD. Total investment costs, including the biogas system, evaporator and dryer, turbine and paddle mixer, have been derived from the FSR and figures have been cross-checked by DNV. Costs for the emergency pond have been calculated based on a purchase order for another lagoon to estimate the price of the open lagoon in the baseline. Land purchase costs of have been sourced from the sales contract of land. Site development costs have been calculated based on the plant layout and FSR. Direct labour cost, including manpower for supervision, WWT operators and laboratory analyst has been sourced from the FSR of

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		generation has been check for consistency in the PDD and spreadsheet. Fuel is required for the diesel gen-set. Evidence is provided for O&M (4% of investment), Administration costs have been deleted for conservativeness. PDD was revised for electricity quantity. Cost of electricity and fuel are justified (refer to financial analysis). Sensitivity analysis has been reviewed including variation of parameters up to when the IRR reaches the benchmark: Heat and electricity production would need increased by 29% and 14% respectively. Quantities of heat and electricity produced from biogas cannot be increased as the calculations are already taken into consideration the maximum amount of biogas available. However, price could fluctuate with time. For the electricity even if we take the actual price (2010), the IRR would still be below the threshold. The price of electricity is highly regulated and thus would not likely to changed easily. In fact the price remained constant from 2005- early 2009.	the project. Fuel costs for the wastewater treatment plant are based on the equipment list in the annexure of supply contract and estimated operating time. Maintenance costs have been estimated to be 5% of the total investment cost. Based on the sectoral competence DNV is of the opinion that this estimate is reasonable in the context of the proposed project activity. . For the cost savings from electricity and heat production: annual steam production is calculated to be 110 TJ as quantity of steam from biogas. Annual electricity production from biogas is estimated to be 7 298 MWh/y. - The electricity price has been appropriately sourced from the website http://www.napocor.gov.ph/power%20rates/eff_rates_for_luzon_grid_prev.htm, which is the average price of electricity in 2007, being available at the time CDM was considered; - The bunker fuel price is derived from the Purchase Order No. 70677 dated 5 July 2007 and has been correctly calculated and applied; - The diesel price for generators has been sourced from the following webpage: http://www.gtz.de/de/dokumente/gtz2009-en-ifp-full-version.pdf. Data for 2008 was used as well as the inflation rate of the Philippines for the respective year, derived

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		The investment costs would need to reduce by 31.75%, which is not possible as the investment was validated compared to actual costs. In fact, the actual costs are much larger as the costs used for the investment analysis are based on a 3 MW turbine while in fact a 4 MW turbine was selected at later stage (however costs saving due to electricity and heart are based on a 4 MW turbine). The operation and maintenance costs are negligible on the IRR. 4. A variation of parameters up to when the IRR reaches the benchmark has been included in the PDD, and discussed. All costs were adjusted in real terms (no inflation considered, except to adjust costs to 2007).	from the national statistics office in the Philippines, in order to estimate the 2007 fossil fuel price. - The IPCC default upper limit of uncertainty at a 95% confidence internal of 43.3 GJ/t is selected for the NCV of diesel /99/since no data from supplier are available. The project participant has provided a reproducible investment analysis spreadsheet including IRR calculation and sensitivity analysis /3/. DNV confirms that the calculations are transparent and complete, in accordance with the applied methodology ACM0014 /87/. **CL is closed.**
CL 12 *Common practise analysis:* 1. Data sources used in the common practise analysis need to be provided; 2. The scope of technology and size needs to be described in more detail; 3. It has to be described why the scope of the common practise analysis is specifically related to wastewater utilization resulting from ethanol plants and not to anaerobic treatment of wastewater (using the same	B.5.43 to B.5.48	1. Sources of data are: 1) List of accredited ethanol distillery, Department of Energy, available at: http://www.doe.gov.ph/AF/BioethanolAccredit.htm accessed on 25 January 2010; 2) the reference to the other plant developed as a CMD project is the following: The plant is San Carlos is registered as a CDM project in (Oct 2006). http://cdm.unfccc.int/Projects/DB/DNV	It is confirmed from the official website of the Philippine Department of Energy that as of 17 August 2009 there are two accredited bio-ethanol producers in the Philippines. The first ethanol producer, i.e. San Carlos has registered a methane recovery project under the CDM (ref. nr. 0931) and can thus be excluded from further consideration. The ethanol plant of Leyte Agri Corporation uses a collecting pond for wastewater treatment, which is of different technology

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
technology as the project) with a comparable composition; 4. The PDD states that there is only one ethanol plant not developed under the CDM. The source for this statement needs to be provided, and also how this project was implemented without CDM revenue.		-CUK1171455227.42; 3) the description of the technology and disposal of the final effluent for the registered project is provided in the PDD, page 22, http://cdm.unfccc.int/Projects/DB/DNV-CUK1171455227.42 and http://www.scbi.ph/environment.html. 2. The size is not relevant, as the technology of the registered project is described in the PDD (using covered in ground reactor), without evaporation, dryer that allowed to use the residues as fuel. 3. The scope is limited to ethanol plants because the characteristic of the wastewater is not comparable with other effluent types. The COD loading varies significantly. Additional explanation is provided in the PDD section B.5, Step 4 Common Practice Analysis (Please see attached a scanned part of Wastewater Engineering Treatment and Reuse, Metcalf and Eddy, 4th edition, table 10-17). 4. The PDD states that there is only two plant developed, but as CDM.	than the project activity. This has been confirmed by a representative of Leyte Agri Corporation via e-mail. Furthermore, it has been confirmed with a representative of the DNA of the Philippines that open lagoon treatment is commonly used for wastewater. Hence, DNV is of the opinion that the treatment of wastewater resulting from an ethanol production facility in a digester system is not common practice in the host country. **CL is closed.**
CL 13 *Parameters available at validation:* 1. The data source for the COD_{in}, COD_{out} and COD removal rate should be clearly referenced in the calculation spreadsheet/ PDD and evidence has to be provided.	B.6.	1. Please refer to the updated document: Lagoon Design Baseline Report Rev2. The reference for COD/BOD5 ration is enclosed. The calculation is shown on page 2 of the document. The values of COD_{in}, COD_{out} and COD removal rate have been included in section B.6.2 of	1. The COD_{in} is 125 000 mg/L as per the design data of the wastewater treatment plant. This is in line with the methodology, which specifies the use of design COD inflow for COD_{in}. The COD_{out} and COD removal rate (99.52%) have been calculated based on

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
Values should be consistent throughout documentation. 2. The depth of open lagoons is inconsistently stated in the project documentation. 3. As per the methodology, the least cost lagoon design option needs to be defined and if several options with comparably low cost exist, the lowest lagoon depth should be chosen. This needs to be clarified. 4. Where IPCC 2006 values are used it needs to be confirmed that no local or regional data is available. 5. The CO_2 factor has been selected for the fossil fuel type used in the *captive power plant*. This needs to be clarified. 6. The surface area of the lagoon needs to be clarified. It is indicated that the surface area is selected according to option 2 whereas the depth of the lagoon is as per option 3 outlined in the baseline lagoon design report.		the PDD. The COD value in section B.6.2 has been corrected from 39,000 tCOD/yr to 37,500 tCOD/yr, consistent with ER calculation. 2. Inconsistencies have been corrected. 3. The lowest cost option was selected and all steps required as per the methodology have been detailed in the PDD. The cost of excavation is constant; however, the land costs for the lowest depth lagoon and lowest cost lagoon were compared. The land cost was 85% higher, which is not comparable. 4. Confirmation that no local or regional data is available was applied. 5. This is for the calculation of emissions reductions associated with the avoidance of bunker fuel in captive plant (on site electricity generator). This parameter was deleted. 6. Please refer to the updated document: Lagoon Design Baseline Report Rev2. Data have been revised. Option 2 has been selected.	the COD/BOD_5 ratio of 2 and the maximum allowable limit for BOD (300 mg/L) as per environmental regulations. Sufficient evidence has been provided. 2. The average depth of the open lagoons has been selected based on the design option chosen. Refer to point 3 below. 3. It is confirmed that the average lagoon depth has been chosen based on the least cost option. At the same time, the selected option is the one with the lowest lagoon depth of 6.5 m. This is in line with the methodology and thus appropriate. 4. Confirmation has been provided that no local or regional data is available and thus the use of IPCC 2006 values is justified. 5. The parameter $EF_{CO2,ff,captive}$ has been removed from project documentation as it had no relevance for ER calculation. The section in the PDD has been revised accordingly. 6. In the ER calculation spreadsheet, sheet 'input data' the surface area of the lagoon has been selected as per option 3 of the baseline lagoon design report (53 870 m^2) and verified to be correctly referenced in the spreadsheet. **CL is closed.**
CL 14 *Grid emission factor:*	B.6.6 B.6.11	1. The source and evidence for calculation of the grid EF is provided in the PDD	Inconsistencies remain in the reporting of the emission factor and further clarification

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
1. Provide sources and evidences for the raw data to calculate the grid EF; 2. Evidence has to be provided that no data is available for 2009 at the time of web-hosting the PDD; 3. The simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. This needs to be demonstrated; 4. It is not demonstrated transparently, which option (A or B) is used in simple OM emission factor calculation; 5. For BM calculation, demonstrate that the power plants listed and contributing to more than 20% of grid generation are the ones built most recently; 6. BM calculation should be based on the latest year for which data is available.	B.6.12 B.6.13 B.6.20	and revised grid emission factor spreadsheet from the Department of Energy. (www.doe.gov.ph/EP/Powerstat.htm). Grid emission factor was reviewed. Please refer to the attached corrected calculations for the NET. Given that 2008 power statistic was the latest available at the time of web-hosting the PDD in February 2010, the **2006-2008** power generation data have been applied as three-year vintage for OM calculation. All inconsistencies have been corrected. 2. The website shown that the latest data available was for 2008 statistics and the latest plant added to the grid was 2006 data. 3. The simple OM method (Option a) is used since the low cost/must run resources constitute less than 50% of the total grid as demonstrated in the Annex 3 of the PDD. In 2008, 2007, 2006, 2005, and 2004 the generation by low cost/must-run plants constituted between 27.14-30.77%, which is less than 50% of total generation by all plants connected to the Luzon-Visayas grid. 4. It has been demonstrated that Option A was used to calculated Simple OM emission factor.	is requested with regard to the EF calculations. Refer to CL raised in Appendix A to this report. **CL is closed.**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		5. Please refer to the update grid calculations. 6. The latest official data available for BM calculation was from 2006. Please refer to the attached revision.	
CL 15 *Baseline emissions:* 1. For power generation, explain the assumptions that the steam turbine is operated 330 d/yr. 2. The following statement needs to be explained: 'since Biomass is 40% of the fuel that supply the boiler, therefore the baseline emission only take into account 60% or electricity generate from biogas'. 3. Provide evidence for the average temperature used to calculate baseline emissions. 4. Explain the data source for the constant value for steam at 8 bar.	B.6.11 B.6.12 B.6.13 B.6.20	1. Refer to maintenance schedule and explanations in ER calculations sheet (elec. consumption). Evidence was already provided. This was reviewed. 2. The statement is no longer used for calculations. 3. The average temperature data was taken from the Department of Science and Technology at La Granjam Lacalota City station. The evidence is enclosed. 4. Refer to energy balance and all references provided.	1. The operating time of the steam turbine has been revised to 300 days. The data source for the 818 kWh (and input parameters as well as calculation to arrive at this value) have been provided. Data has been consistently applied throughout the documents. 2. The statement has been removed from the project documentation. 3. Evidence for the mean temperature has been provided and it was confirmed that values are consistently stated. 4. The total amount of steam that can be produced with the boiler is equivalent to 807 TJ/yr. Calculations are based on the boiler capacity, operating hours and calorific value of the saturated vapour enthalpy. The proposed project is able to supply 110 TJ/ year steam, and this has been transparently demonstrated in the spreadsheet, with assumptions and sources of data included. **CL is closed.**
CL 16 *Project emissions:* 1. The data source for the amount of biogas collected in the outlet of the digester needs to	B.6.14 B.6.15 B.6.16 B.6.20	1. This was calculated for ex-antes estimation. The reference was made to the amount of biogas expected on P. 23 of the feasibility report.	1. For ex-ante ER calculations the expected amount of biogas has been derived from the FSR. This value will be monitored for actual ER calculation, which is

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
be provided. 2. The type of flaring system needs to be consistently stated in the PDD. 3. The assumption of 55% methane concentration needs to be explained in further detail. 4. It needs to be clarified if electricity/fossil fuel is consumed in case of emergency or during maintenance. 5. It needs to be further discussed why PE from treatment of wastewater effluent from the anaerobic digester are not included in the ER calculation, since effluent is directed to (i) a dewatering facility and to (ii) a lagoon in case of emergency. 6. Furthermore, the following statement *'the subsequent steps in the process (evaporator and CPU) will not be generating methane as the temperature at the evaporator is higher than 90 ºC, which is an inhibiting factor for the anaerobic activity to occur*' needs to be discussed and substantiated with evidence.		2. Type of flaring (open) was justified: KBK Transmittal No.: KBK-813-RBC-TRN-040, 2 April 2010. 3. Assumption was justified: EIA, Oct 2008, page 3.8. 4. Fossil fuel will be consumed; this was included, together with the references. 1.34: conversion of HP to kW. NCV does no longer apply to project emissions calculations. So it is consistently applied. 5. PE from treatment of wastewater effluent from the anaerobic digester are not included in the ER calculation because dewatering of wastewater effluent through evaporator and CPU will not be generating methane as the temperature at the evaporator is higher than 90 ºC, which is an inhibiting factor for the anaerobic activity to occur. In addition, emergency pond will not generate methane, since the residence time of wastewater effluent is only 1 day. However, the residence time of the thermophilic process is about 14 days. (http://www.appropedia.org/Anaerobic_digestion) 6. The reference is included in the PDD as footnote 63. It stated that most bacteria are thermophilicphiles, which grow within the range 10-45º C with an	deemed reasonable. 2. It was confirmed by verifying the letter from the equipment provider that the flare is of open type. The PDD has been revised to clearly reflect this. 3. Sufficient evidence for the methane concentration in the biogas (55%) has been provided. The value applied is deemed reasonable. 4. Fossil fuel will be used in the event of emergency, and emissions thereof have been appropriately considered in the revised PDD. Project emissions from fossil fuel consumption have been reviewed and are now found to be correctly calculated as PE_{FC} (Project emissions from fossil fuel combustion in year y). 5. The proposed project uses a closed system, where treated wastewater is further dried and final sludge is burnt in the boiler along with the bagasse and biogas.. In the case of emergency, wastewater will be pumped to an emergency lagoon. Though emergency lagoon is not foreseen to be used, the emission from electricity consumed to pump wastewater in the event of emergency still need to be considered. 6. Treated wastewater is further dried, and hence is subjected to high temperature. The high temperature which inhibits

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		optimum temperature for maximum growth occurring at 30-40ºC. Thermophilic bacteria grow only poorly at temperatures of 50-60 º C. Microbiology and Chemistry for Environmental Scientists and Engineers (2nd Edition) J.N. Lester and J.W. Birkett. In addition the emergency lagoon. The temperature which the evaporator operates is 90 ºC.	anaerobic activity is deemed acceptable. Refer to CL raised in Appendix A to this report. **CL is closed.**
CL 17 *Monitoring plan:* 1. The monitoring plan should include a description of the following parameters: (i) Days of operation of the system; (ii) flare efficiency and (iii) flare operation; 2. The measurement equipment/method is not clearly described for each parameter; 3. Include in the monitoring plan if the flow rate of the residual gas and the methane concentration is measured on a dry or wet basis; 4. The measurement accuracy is not described for all relevant parameters; 5. The monitoring and recording frequency has to be described in the PDD for each parameter.	B.7	a. The (i) Days of operation of the system is included in the monitoring plan. (ii) Flare efficiency will not be measure since, the default value is adopted. The parameter has been included in the PDD section B.6.2. (iii) Flare operation will be monitored by measuring the temperature of the flare, as per the monitoring plan. The statement "If the flare is not operational the default value to be adopted for flare efficiency is 0%." Also included in the PDD section B.6.3. The monitoring of temperature of the flare in section B.7.1 also indicates the efficiency of the flare as stated by the tool. b. The measurement equipment/method is described to greater detail in the PDD. The parameter to monitor the temperature of the flare is included in Section B.7.1 of the PDD. c. The flow rate of residual gas will be measured in wet basis. The monitoring	1. The monitoring plan is still inconsistent in terms of information given in section B.7.1, B.7.2 and Annex 4 of the PDD. Further clarification is requested. 2. The measurement equipment is now described for the relevant parameters included in the monitoring report. 3. The flow rate of the residual gas and the methane concentration are measured on wet basis. This has been included in the revised PDD. 4. At the time of writing, the accuracy of the monitoring equipment has not been defined and further clarification with regard to current project implementation of monitoring system is requested. 5. Monitoring and reporting frequency has been sufficiently described in the PDD. Refer to CLs raised in Appendix A to this report. **CL is closed.**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
		plan contained in the PDD has been updated. d. Accuracy is not available yet for all equipment, however the gas flow meters have accuracy of 99% (see the attached certificates of calibration). e. The monitoring and reporting frequency is included in Table "Equipment Archiving and Responsibility", Annex 4 of the PDD.	
CL 18 *Monitoring procedures:* Procedures for day-to-day record handling, data management and quality assurance are not sufficiently described in the PDD (i.e. procedures for training of monitoring personnel, emergency preparedness for cases where emergencies can cause unintended emissions, procedures to identify corrective actions in order to provide for more accurate future monitoring and reporting, etc.).	B.7.9 B.7.10	Text has been added in the PDD. In addition, please refer to the CDM monitoring plan attached.	The relevant monitoring procedures have been correctly included in the monitoring plan of the PDD. **CL is closed.**
CL 19 *Local Stakeholder Consultation:* 1. The date for the local stakeholder meeting shall be consistently stated in the PDD and the number of stakeholders attending the meeting shall be updated; 2. The PDD shall include more information on the type of stakeholders (public/ private entities) that have been invited; 3. During site visit it was confirmed that village chairmen were invited by invitation letters.	E.1.1	a. The date of the local stakeholder meeting was 20/09/2008, the number of the stakeholder attended the meeting was 120 as shown in the annex 9.8 of the EIA. b. The PDD has included more information on the type of stakeholders invited. c. The information is clarified in the PDD.	1. The date of the local stakeholder consultation was 20 September 2008. The date 30 May 2008 refers to a public scoping exercised, which is required under the regulations in the Philippines. 2. Further information on the type of stakeholders has been included in the PDD. 3. Clarified in the PDD. **CL is closed.**

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
Information was further cascaded to public by the local and zone leaders. This needs to be clarified in the PDD.			

Table 4 Forward action requests

Forward action request	Reference to Table 2	Response by project participants
FAR		Not applicable

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APPENDIX C

CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS

Marlene Fischer

Marlene Fischer holds a Diplom-Ingenieur (DI) degree in Energy and Environmental Management. Having an overall work experience of around 7 years. Prior to joining DNV having 1 year experience in the waste / wastewater treatment industry covering landfill site technology and management as well as consulting in landfilling and wastewater treatment projects; 2 years of experience in the oil and gas industry, being responsible for emission monitoring, GHG inventory and HSEQ at a refinery.

In DNV, she has experience of 4 years in validation and verification of numerous CDM projects.

Wong Yon Sing

Simon Wong Yon Sing holds a Bachelor's Degree in Chemical Engineering with Environmental Engineering, with a year experience in the field of design and operation/maintenance of wastewater treatment as part of working in wastewater design & equipment supply services. His experience in designing and maintaining the wastewater treatment systems covers the fields of various manufacturing and chemical industries in Malaysia.

He has experience of more than 3 years in validation and verification of numerous CDM projects in DNV, both in Malaysia and abroad. His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in Energy Generation from Renewable Energy Sources, Waste Handling and Disposal and Animal Waste Management System.

Kamala Muniandy Devi

Kamala Devi Muniandy holds a Bachelor’s (Hons) Degree in Applied Chemistry. Having an overall experience of around 14 years. Prior to joining DNV having around 14 years of experience in manufacturing industry covering product laboratory research and development, and quality assurance in manufacturing industry. She has also been actively involved in the setting up and implementation of ISO 9001 / 14001 in pulp and paper manufacturing in Indonesia and lubricants manufacturing in Malaysia for 6 and 5 years respectively.

She has experience of close to 4 years in validation and verification of numerous CDM projects in DNV in South East Asia region. Her qualification and experience in CDM demonstrates her sufficient sectoral competence in waste handling and disposal.

Krishnan Namboodiri

Krishnan Namboodiri, Project Manager, DNV Kochi, India. Holds graduate degree in chemical engineering and has done a short term diploma course in Management. Prior to joining DNV in 2008, has had 24 years of direct work experience in the fertilizer and chemicals industry. Work experience covers 5 years in process design & engineering for

chemical industry 7 years in technical services including environment management activities, 7 years in project management and 5 years in training & corporate planning in fertilizer & petrochemical manufacturing units. He has been actively involved in Management System Audits as per ISO 14001 for more than 8 years.

The above work experience includes (a) experience in steam system optimisation & trouble shooting , development of improvement schemes in large fertiliser & caprolactum complex (b) Design and engineering, efficiency studies and development of efficiency improvement schemes for fossil fuel fired steam & power generation plants (c) Implementation of energy saving measures in Ammonia plants , sulphuric acid plant (d) Monitoring, trouble shooting and development & implementation of improvement schemes for of pollution control facilities (chemical, aerobic & anaerobic treatment systems) in Fertiliser and petrochemical complex. Development & Implementation of landfill facilities for solid and hazardous wastes from fertiliser & caprolactam manufacturing complex.

He has received extensive training in the CDM validation and verification process. He is an appointed GHG auditor for the CDM validation and verification program of DNV and has performed validation & verification of several CDM projects.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in (1) Thermal energy generation from fossil fuels as well as thermal electricity from solar and (2) waste handling and disposal.

Agnes Dudek

Agnes Dudek holds a PhD Degree in applied physics. Having an overall experience of 11 years. Prior to joining DNV having 7 years experience in scientific research covering satellite remote sensing, mesoscale weather forecast modelling and air pollution dispersion modelling and monitoring.

She has experience of around 4 years in validation and verification of numerous CDM projects.

Her qualification, research experience and experience in CDM demonstrate her sufficient sectoral competence in energy generation from renewable energy sources.

Fathullah Akmal Khalid

Fathullah Akmal Khalid holds 2 Bachelor degrees majoring in both Chemical Engineering and Commerce from The University of Melbourne, Australia. Prior to joining DNV, Fathullah had experience as an internal auditor with a Malaysian conglomerate. Subsequently, he joined the cement manufacturing industry and had experience in cement engineering in a few Malaysian cement plants. His experience covers the fields of cement manufacturing operations, process optimization, grinding and milling processes.

He has been exposed to CDM since 2011 and has ample experience in validation and verification of numerous CDM projects. His CDM experience includes waste handling from the oil palm and starch industries. His qualification, industrial experience and experience in

CDM demonstrate his sufficient sectoral competence in Cement and Waste Handling and Disposal.

Wan Hasliza SM Jamaluddin

Wan Hasliza SM Jamaluddin holds a Bachelor's Degree in Chemical Engineering. Having an overall experience of around 11 years. Prior to joining DNV having 4 years in the field of project management for natural gas pipeline construction and four years on the implementation of Montreal Protocol for Malaysia. Her experience covers the fields of construction and environmental management.

She has experience of around three years in validation and verification of CDM projects in DNV in South East Asia region.

Her qualification, industrial experience and experience in CDM demonstrate her sufficient sectoral competence in "Waste Handling and Disposal" and "Energy Generation from Renewable Energy Sources".

Michael Lehmann

Michael Lehmann holds a Master Degree in Environmental Sciences with a specialisation in environmental chemistry. He has an overall working experience of around 13 years.

Since 1999 he has worked in the climate change field and has closely followed the international response to the climate change challenge (UNFCCC, Kyoto Protocol) and the responses by national governments (EU ETS, UK ETS) and business. He has managed the validation and verification of many CDM and JI projects and thas carried out the technical review of numerous climate change project validations and verifications.

Through his extensive work with validation and verification of CDM and JI projects, he has aquired sectoral competence within energy generation from renewable energy sources.

Ole A. Flagstad

Ole A. Flagstad holds a Master Degree in thermodynamics/energy efficiency and has an overall working experience of around 20 years. He has worked both in public and private sector, including 5 years with a research institute (IFE) where specific responsibilities included running an energy efficiency network in the food industry and direct intervention with the industry. Other work experience includes working in European research programmes, administering national research programmes and International Energy Agency annexes.

Ole A. Flagstad has more than 56 years experience in validation and verification of projects within CDM, JI and other carbon credit schemes. His qualifications and experience in carbon credit schemes (primarily CDM and JI), qualifies him for different roles in a broad group of technical areas.