VALIDATION REPORT

"BRASCARBON Methane Recovery Project BCA-BRA-13" in Brazil

REPORT NO. 2009-1530

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VALIDATION REPORT

Date of first issue: 2009-11-03		Project No.: PRJC- 175371-2009 -CCS-BRA
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Client: Brascarbon Consultoria, Projetos e Representação S/A & Luso Carbon Fund - Fundo Especial de Investimento Fechado		Client ref.: Mario Pacifico and Luis Costa

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Project Name: "BRASCARBON Methane Recovery Project BCA-BRA-13"
Country: Brazil
Methodology: AMS-III.D **Version:**17 Sectoral scope: TA13.2
GHG reducing Measure/Technology: *"Methane recovery in animal manure management systems"*
ER estimate: 391 482 tCO_2e over 7 years (55 926 tCO_2e annually)
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

This validation report summarizes the findings of the validation.
The only changes made to this version of the validation report compared to the validation report rev. 01 dated 30 March 2010 referred to in the letter of approval of the DNA of Brazil are linked to the status of issuance of the letter of approval by the DNA of Brazil /16/ and the updating of the PDD to the latest version of AMS-III.D methodology. Moreover, it was confirmed that the validation report confirms with the requirements of version 01.2 of the VVM.
In summary, it is DNV's opinion that the "BRASCARBON Methane Recovery Project BCA-BRA-13", as described in the PDD version 05 of 20 May 2011, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology AMS-III.D, version 17. DNV thus requests the registration of the project as a CDM project activity.

Report No.:	Subject Group:		
2009-1530	Environment		**Indexing terms**
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Abbreviations

B_0	Maximum methane producing capacity of the manure (m^3CH_4/kg VS)
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
EB	Executive Board
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
INPE	National Institute of Space Research
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MCF	Methane Conversion Factor
NGO	Non-governmental Organisation
NPV	Net Present Value
ODA	Official Development Assistance
O&M	Operation and maintenance
PDD	Project Design Document
SELIC rate	Special System of Clearance and Custody
UNFCCC	United Nations Framework Convention on Climate Change
VS	Volatile Solids produced daily per head

VALIDATION REPORT

1 EXECUTIVE SUMMARY – VALIDATION OPINION

DNV Climate Change Services AS (DNV) has performed a validation of the "BRASCARBON Methane Recovery Project BCA-BRA-13", located in the Mato Grosso do Sul State, Brazil. *The validation was performed on the basis of UNFCCC criteria for CDM project activities and relevant Brazilian criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.*

The project participant is Brascarbon Consultoria, Projetos e Representação S/A of Brazil and Luso Carbon Fund - Fundo Especial de Investimento Fechado. *The host Party Brazil and Annex I Party Portugal meet all relevant participation requirements of CDM project activity and has provided written approval of voluntary participation in the project.*

The objective of the project is to capture and burn the biogas generated through the decomposition of the swine manure produced at selected swine farms.

By improving the environmental and working conditions for swine production, the project is in line with the current sustainable development priorities of Brazil.

The project applies the approved simplified baseline and monitoring methodology AMS-III.D, i.e. "Methane recovery in animal manure management systems" (version 17). The baseline methodology has been correctly applied and the assumptions made for the selected baseline scenario are sound. It is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions attributable to the project are additional to any that would occur in the absence of the project activity.

The monitoring methodology has been correctly applied. The monitoring plan sufficiently specifies the monitoring requirements of the main project indicators.

The total emission reductions from the project are estimated to be on the average 55 926 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.

By capturing and destroying biogas (CH_4) from swine manure, the project results in reductions of CO_2 emissions that are real, measurable and give long-term benefits to the mitigation of climate change. Emission reductions are directly monitored and calculated ex-post, using the approach given in AMS-III.D (version 17). The ex-ante estimation of emission reductions and the projected biogas generation from the swine manure was determined using the 2006 IPCC tier 2 approach.

In summary, it is DNV's opinion that the "BRASCARBON Methane Recovery Project BCA-BRA-13", as described in the revised project design document version 05 *of 20 May 2011, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology AMS-III.D (version 17). Hence, DNV will request the registration of the "BRASCARBON Methane Recovery Project BCA-BRA-13" as a CDM project activity.*

Rio and Oslo, 20 August 2011

Luis Filipe Tavares
CDM Validator
DNV Rio, Brazil

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

2 INTRODUCTION

Brascarbon Consultoria, Projetos e Representação S/A has commissioned DNV Climate Change Services AS (DNV) to perform a validation of the "BRASCARBON Methane Recovery Project BCA-BRA-13", located in the Mato Grosso do Sul State, Brazil. This validation 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, the simplified modalities and procedures for small-scale CDM project activities and the subsequent decisions by the CDM Executive Board.

2.1 Validation 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 and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD) **/1/**. 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 AMS-III.D (version 17) /19/. The validation team has based the validation on the recommendations in the Validation and Verification Manual **/18/**.

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.

3.1 Desk Review of the Project Design Documentation

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

3.1.1 Documentation provided by the project participants

/1/ Brascarbon Consultoria, Projetos e Representação S/A, Project Design Document for the "BRASCARBON Methane Recovery Project BCA-BRA-13". Version 1 of 16 January 2009, version 2 of 2 December 2009, version 3 of 13 January 2010, version 4 of 1 March 2010 and version 05 of20 May 2011.

/2/ Brascarbon Consultoria, Projetos e Representação S/A, Emission reduction calculation: spreadsheet Brascarbon PDD 13 CERs version 4.

/3/ Brascarbon Consultoria, Projetos e Representação S/A, Financial analysis spreadsheet Brascarbon PDD 13 IRR version 7.

/4/ Letter of Intent issued on 01 June 2007 by Climate Change Capital Ltd / Ecoprogresso to Brascarbon for purchasing of emissions reductions from piggery waste methane reductions projects in Brazil.

/5/ Investment analysis – input parameters:

- Biodigester costs:
  - Proposal from Vinimaster Ind. Com. E Confecções Ltda. Dated 18 January 2009.
  - Proposal from Construções Teixeira e Silva Ltda. Dated 22 January 2009.
  - Proposal from Cadesenhos Desenhos Técnicos e Serviços Topográficos. Dated 18 February 2009.
  - Proposal from Vitor Luis Kuhn – ME. Dated February 2009.
  - Proposal from A&P Pezzzato Construções Ltda – ME. Dated 19 February 2009.
- Flare costs:
  - Proposal from Ecogás. Dated 1 March 2009.
- Flow meter
  - Proposal from Endress + Hauser. Dated 29 May 2009.
- Electricity generator:
  - Proposal from Grupo Fockink – Energia Alternativa. Dated 11 March 2009.

/6/
- Sow purchase receipt 13184 from Agroceres sold to Granjas Piaseski.
- Letter from Cargill confirming Topigs genetic for the following swine farms: Sitio São João Lote 07 Qda. 28, Lote Rural 12, Sítio Palmeiras – Lote 56, Sítio Nossa Senhora Aparecida, Fazenda Chapadão, Granja Chapadão, Sítio Lote 3 Qda. 27, Sítio Lote 23 Qda. 27, Chácara Jateí Lote 45, Sítio Lote 11 Qda. 24, Sítio Lote 54 Qda. 10, Sítio Lote 11 Qda. 27.

/7/ Brascarbon Swine food formulation from Cargill and Multimix
Cooasgo Cooperativa Agropecuária spreadsheet regarding food formulation.

/8/ Brascarbon Farms Environment Licenses.

/9/ Brascarbon Farms Geographic Coordinates:

BCA-164MS1-13	Granjas Piaseski	Estr. Barreirinho Km 07 Jateí / MS	22.5128 S 54.2506 W
BCA-137MS1-13	Lote Rural 12	Linha Barreirinho – Nascente km 06 Jateí / MS	22.4489 S 54.3356 W
BCA-203MS1-13	Chácara Jateí Lote 45	Linha Oculto Km 0 Nascente Jateí / MS	22.5388 S 54.3308 W

BCA-202MS1-13	Sitio Lote 23 Qda. 27	Linha Barreirinho – Nascente Km 15 Jateí / MS	22.5440 S 54.1433 W
BCA-204MS1-13	Sitio Lote 11 Qda. 24	Zona núcleo colonial de Dourados Jateí / MS	22.4840 S 54.3534 W
BCA-193MS1-13	Sitio Nossa senhora Aparecida	Linha Barreirinho - Lote 05 Qda. 29 Jateí / MS	22.4617 S 54.3515 W
BCA-178MS1-13	Sitio Palmeiras - Lote 56	Linha Potreirit Lote 56 Quadra 54 Jateí / MS	22.5219 S 54.3124 W
BCA-205MS1-13	Sitio Lote 54 Qda. 10	Linha oculto Km 1,5 Nascente Jateí / MS	22.5504 S 54.3225 W
BCA-198MS1-13	Granja Chapadão	Linha barreirinho, Lote 11, Qda. 27 Jateí / MS	22.5393 S 54.1422 W
BCA-201MS1-13	Sitio Lote 3 Qda. 27	Linha barreirinho Jateí / MS	22.5252 S 54.1709 W
BCA-197MS1-13	Fazenda Chapadão	Linha Barreirinho Lote 29, Qda. 27 Jateí / MS	22.5393 S 54.1422 W
BCA-207MS1-13	Sitio Lote 11 Qda. 27	Linha Barreirinho Lote 11, Quadra 27 Jateí / MS	22.5331 S 54.1628 W
BCA-086MS1-13	Sitio São João Lote 07 Qda. 28	Linha Barreirão Sitio São João Jateí / MS	22.4997 S 54.2597 W

/10/ Brascarbon Construction schedule PDD 13

/11/ Brascarbon Operation Procedures Manual:
POP 1 Combustion Temperature Monitoring Tf
POP 2 Rules of Town
POP 3 Swine Population Counting
POP 4 Biogas volume measuring Bg_{burnt}
POP 5 Methane Contend Monitoring W_{ch4}
POP 6 Biogas Temperature Monitoring
POP 7 Methane Density - Dch_4
POP 8 Flare Efficiency Timetable Fey
POP 9 Biodigestor Sludge Removal
POP 12 General Maintenance
POP 13 Biogas Pressure Monitoring
POP 14 Swine Feed Formulation
POP 15 Swine genetic source
POP 16 Swine Weight
POP 17 Ex-post yearly emission reductions

/12/ Brascarbon Format 03.003 for swine population account

/13/ Brascarbon Pictures of the farms provided by the project participant.

/14/ ECOGAS enclosed flare specification

/15/ Brascarbon Stakeholders' consultation process: invitation letters sent to local stakeholders on 4 May 2009 and mail receipts.

3.1.2 Letters of approval

/16/ Comissão Interministerial de Mudança Global do Clima (DNA of Brazil): *Letter of Approval*. 24 August 2010.
http://www.mct.gov.br/index.php/content/view/319063.html

/17/ Comissão para as Alterações Climáticas (DNA of Portugal): *Letter of Approval*. 16 July 2010.

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

/18/ CDM Executive Board: Validation and Verification Manual Version 01.2.
http://cdm.unfccc.int/EB/044/eb44_repan03.pdf

/19/ CDM Executive Board: Appendix B of the "Simplified modalities and procedures for small-scale CDM project activities": Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activities. AMS-III.D – "Methane recovery in animal manure management systems" Version 17.

/20/ CDM Executive Board: Appendix B of the "Simplified modalities and procedures for small-scale CDM project activities": Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activities. AMS-III.H – "Methane recovery in wastewater treatment" Version 16.

/21/ CDM Executive Board: Attachment A to the Appendix B of the "Simplified modalities and procedures for small-scale CDM project activities": Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activities. Version 06 of 30 September 2005.

/22/ CDM Executive Board: GUIDELINES ON THE ASSESSMENT OF INVESTMENT ANALYSIS Version 03.1

/23/ CDM Executive Board: Tool to determine project emissions from flaring gases containing methane. Annex 13 EB 28 report.

/24/ 2006 IPCC Guidelines for National Greenhouse Gas Inventories– Volume 4 Chapter 10

/25/ GSC of "BRASCARBON Methane Recovery Project BCA-BRA-13"
http://cdm.unfccc.int/Projects/Validation/DB/PNYLRRMZTLKBSD9BF8A3PSP9OPOHPA/view.html

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

/26/ Mato Grosso do Sul State Annual average temperature: http://satelite.cptec.inpe.br/PCD/

/27/ Electricity price in Brazil: http://www.aneel.gov.br/area.cfm?idArea=550
http://rad.aneel.gov.br/reportserverSAD?%2fSAD_REPORTS%2fSAMP_TarifaMedCConsumoRegiao&rs:Command=Render

/28/ Methane analyzer http://www.geotech.co.uk/Downloads/Portable_Biogas_datasheet.(NEW%202)pdf.pdf.

/29/ Brazilian Swine Producers Association
http://www.abcs.org.br/portal//mun_sui/producao/genetica/principais.jsp
http://www.aps.org.br/component/content/article/1-timas/357-a-energia-gerada-pela-

suinocultura-.html

/30/ Western Europe Genetic suppliers in Brazil:
- Agrocerespic http://www.agrocerespic.com.br/quemsomos/index.html (joint venture of Agroceres and Pig Improvement co from UK; http://www.agroceresnutricao.com.br/principal_1024.jsp
- TOPIGS http://www.topigs.com/
- DanBred http://www.danishpigproduction.dk/

/31/ Brazilian swine producers and CDM developers
- Sadia: http://www.sadia.com.br/br/instituto/
- Perdigão: http://www.perdigao.com.br/empresasperdigao/instituto1.cfm?codigo=15
- AgCert: http://www.agcert.com/
- Ecobio: http://www.ecobiocarbon.com.br/

/32/ Brazilian government loan - SELIC
http://www.bcb.gov.br

/33/ Brazilian Water Environment Legislation
http://www.mma.gov.br/port/conama/res/res05/res35705.pdf

/34/ Practice of swine manure treatment
http://www.cnpsa.embrapa.br/down.php?tipo=publicacoes&cod_publicacao=186

/35/ Swine manure project installed in Brazil:
- Project Design Document for the BRASCARBON Methane Recovery Project BCA-BRA-01 version 5a of 4 March 2009. UNFCCC ref. 2318.
- Project Design Document for the Project of treatment and swine's manure utilization at Ecobio Carbon – Swine Culture Nº 1 version 3 dated 2 December 2008. UNFCCC ref. 2939.
- Project Design Document for the Perdigão Sustainable Swine Production 01 – Methane capture and combustion version 04 of 1 June 2009. UNFCCC ref. 2249.

Main changes between the version of the PDD published for the 30 days stakeholder consultation period and the final version of the PDD are as follows:

- More explanation on the investment barrier;
- Update crediting period starting date;
- Changes related to the CARs and CLs identified in the DNV's draft validation report;
- Update methodology version.

3.2 Follow-up Interviews with Project Stakeholders

On 06 October 2009, DNV visited and assessed 4 farms (Sítio São João Lote 07 Qda. 28, Granjas Piaseski, Sítio Palmeiras-Lote 56 and Granja Chapadão) of a total of 13 farms (a random sample of the square root of all farms) in order to verify that the current manure management practise is open anaerobic lagoons with depths greater than 1 meter. In addition, DNV performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. The baseline situation (i.e. open lagoons) of the others farms included in PDD was verified by assessing pictures provided by the project participant. Moreover, DNV was able to confirm that the usual practice is to use the anaerobic open lagoon with methane emissions escaping to the atmosphere through reviewing the applicable environment legislation **/33/** and the environment licenses of each farm **/8/**.

DNV deemed that the documentary evidences provided for all farms and the site visit performed to a random sample of the farms are sufficient to validate that the baseline situation at all farms is treatment of manure in open anaerobic lagoons with a depth of at least one meter.

The following representatives of the project participants were interviewed:

	Date	Name	Organization	Topic
/36/	2009/10/06	David Garcia	Ecoprogresso	• Cross check the farms geographic coordinates • Additionality of the project • Project starting date • Monitoring plan • Baseline emission estimation • Historic average swine population • Environmental Licenses/legal compliance • Stakeholders consultation process • Baseline scenario (open anaerobic lagoon) • Operation and monitoring control (procedures)
/37/	2009/10/06	Mario Pacífio da Silva	Brascarbon	
/38/	2009/10/06	Afonso Libero Rosalen	Brascarbon	

3.3 Resolution of Outstanding Issues

The objective of this phase of the validation was to resolve any outstanding issues which needed to be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol wais 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 three tables. The different columns in these tables are described in the figure below. The completed validation protocol for the “BRASCARBON Methane Recovery Project BCA-BRA-13” is enclosed in Appendix A to this report.

Findings established during the validation can either be seen as a non-fulfilment of CDM criteria or where a risk to the fulfilment of project objectives is identified. Corrective action requests (CAR) are issued, where:

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

ii) The CDM requirements have not been met;

iii) 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.

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 Quality Control

The validation report underwent a technical review before requesting registration of the project activity. The technical review was 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 13.2 competence
Team leader (Validator)	Leiroz	Andrea	Brazil	✓	✓	✓	✓		
Expert	Tavares	Luis Filipe	Brazil	✓		✓			✓
Assessor under training	Philipi	Fabiana	Brazil	✓					
Assessor under training	Baines	Gabriel	Brazil			✓			
Assessor under training	Scalon	Juliana	Brazil			✓			
Technical reviewer	Ramachandran	Ramesh	India					✓	✓
Technical reviewer	Lehmann	Michael	Norway					✓	✓
Technical reviewer	Wong	Simon Yon Sing	Malaysia					✓	✓

The qualification of each individual validation team member is detailed in Appendix B 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 revised project design documentation of 20 May 2011 /**1**/.

4.1 Participation Requirements

The project participants are Brascarbon Consultoria, Projetos e Representação S/A (the project proponent) from the host Party Brazil and Luso Carbon Fund - Fundo Especial de Investimento Fechado of Portugal is participating on behalf of Portugal as Annex I Party. The host Party Brazil and the Annex I Party Portugal meet all relevant participation requirements of CDM project activity.

A letter of approval (LoA) /16/ was issued by DNA of Brazil on 24 August 2010 and a LoA /**17**/was issued by DNA of Portugal on 16 July 2010, authorizing Brascarbon Consultoria, Projetos e Representação S/A of host Party and Luso Carbon Fund - Fundo Especial de Investimento Fechado of Annex I Party as project participants and confirming that the project assists in achieving sustainable development.

Brazil has ratified the Kyoto Protocol on 23 August 2002. The Brazilian designated national authority for the CDM is the Comissão Interministerial de Mudança Global do Clima.

Portugal has ratified the Kyoto Protocol on 31 May 2002. The Portuguese designated national authority for the CDM is the Comissão para as Alterações Climáticas.

The letters of approval were received from the project participants. DNV does not doubt the authenticity of the letters of approval. DNV considers the letters are in accordance with paragraphs 45- 48 of the VVM /16/.

4.2 Project Design

The “BRASCARBON Methane Recovery Project BCA-BRA-13” consists of the implementation of anaerobic digesters at 13 farms located in the Mato Grosso do Sul State, Brazil. The installation of anaerobic digesters aim to treat the manure under controlled conditions as well as capture and burn the methane generated by the decay of swine manure from the farms.

The facility drains the overflow, with lower organic matter content, from anaerobic digesters to the existent open lagoon, which stores the effluents. Effluents are normally used for crop irrigation.

The project will initially only flare the biogas, but in case of favourable conditions at the farms in the future, biogas may also be utilized to generate electricity for own consumption (in accordance with AMS-III.D version 17). Nonetheless, page 6 of the PDD version 05 clearly states that if electricity will be generated, no CERs will be claimed from displacing grid electricity.

The project is expected to bring social, economic, technological and environmental benefits, thus contributing to sustainable development objectives of the Brazilian Government. The

DNA of Brazil has confirmed that the project assists in achieving sustainable development /16/.

The starting date of the project activity is expected to be 15 June 2011, which will be the date of signing the construction contract for the first farm. DNV has verified the chronology and considers that the choice of starting date is appropriate and in line with the guidelines of EB 41. However, the actual project starting date will be subject to verification by the verifying DOE.

A 7-years renewable crediting period is selected (with the potential of being renewed twice), starting from 1 January 2012 or the date of registration project activity with an expected operational lifetime of 21 years.

No public funding is involved, and the validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Brazil.

Although the project participant has other small scale projects with the same methodology, all farms included in these projects are at a distance of more than 1 km from the sites included in this project. The project includes farms in Mato Grosso do Sul State, at the municipality of Jateí. Only this PDD has farms in the municipality of Jateí. Hence, the project is not a de-bundled component of a larger project activity.

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 Baseline Determination

The project applies the simplified baseline methodology for selected small-scale CDM project activity AMS-III.D version 17 – "*Methane recovery in animal manure management systems*" /19/.

The project meets the applicability criteria of AMS-III.D version 17 as it is demonstrated that:

- The project activity recovers methane generated in the treatment of swine manure by installing methane recovery and combustion systems. The environmental legislation of Brazil does not permit discharge of effluent from swine farms to the water bodies **/33/**. The usual practice is to use the anaerobic open lagoon with methane emissions escaping to the atmosphere;
- The livestock population in the 13 farms is managed under confined conditions. This was verified through reviewing the environment licenses of each farm /8/. This comply with para 1(a) of AMS-III.D version 17;
- Manure or effluents generated after treatment in the anaerobic bio-digesters is not discharged into natural water resources. This was verified through reviewing the, applicable environment legislation /33/ and the environment licenses of each farm /8/. This comply with para 1(b) of AMS-III.D version 17;
- The annual average temperature of baseline site (Mato Grosso do Sul State) is 23 – 25 °C and hence higher than the methodology stipulated temperature of 5°C. This was verified through information available on INPE (National Institute of Space Research) web site /26/ This comply with para 1(c) of AMS-III.D version 17;
- The retention time of waste in the anaerobic open lagoons has been demonstrated to be greater than 1 month, as verified through environmental licenses of each farm /8/. The depth of the open lagoons is greater than 1 meter, as verified through the site visit at the

Sítio São João Lote 07 Qda. 28, Granjas Piaseski, Sítio Palmeiras-Lote 56 and Granja Chapadão swine farms /36/-/38/ and pictures provided by the project participant for the remaining sites /13/. This comply with para 1(d) of AMS-III.D version 17;

- No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario as verified through the site visit at the Sítio São João Lote 07 Qda. 28, Granjas Piaseski, Sítio Palmeiras-Lote 56 and Granja Chapadão swine farms /36/-/38/ and pictures provided by the project participant for all farms /13/. This comply with para 1(e) of AMS-III.D version 17;
- The final sludge will be handled aerobically. It will be applied in the soil, according with the proper conditions and procedures, being assured that no methane emissions are resulting from this application. The project involves the use of treated effluent for irrigation in farms and application of stabilized sludge on crops irrigation in farms, without any anaerobic conditions. The practice is to distribute the sludge over the field according the usual practice to improve the field fertilization. This comply with para 2(a) of AMS-III.D version17;
- The project involves facilities to burn (flaring) all biogas generated by the digester. This comply with para 2(b) of AMS-III.D version 17;
- The storage time of the manure after removal from the animal's barns does not exceed 45 days before being fed into the anaerobic digester as the barns are connected directly withbiodigester, as verified during the site visits /36/-/38/. This comply with para 2(c) of AMS-III.D version 17;
- The project does not involve any landfill activity. The project activity recovers methane generated in the treatment of swine manure by installing methane recovery and combustion systems (biodigester). This comply with para 3 of AMS-III.D version 17;
- In adequate conditions, the project activity will install electricity generator for in site electricity supply of according established on para 3(a) of AMS-III.H version 16 /20/, although no claims for emissions reductions by the electricity generation will be requested during the entire project activity, only by the emissions reductions of the biogas destroyed in the generators. This comply with para 4 of AMS-III.D version 17;
- The project is new, and no capture and flaring facilities had existed before the implementation of project activity. This comply with para 5 of AMS-III.D version 17;
- As well as, no replace equipment will be done, and the lifetime of project activity was established as 21 years. This comply with para 5 of AMS-III.D version 17;
- The estimated emissions reductions of 55 926 tCO_2e are lower than the limit 60 kt CO_2 equivalent /2/. This comply with para 7 of AMS-III.D version 17;
- The project involves the use of treated effluent for irrigation in farms and application of stabilized sludge on crops irrigation in farms, without any anaerobic conditions. The practice is to distribute the sludge over the field according the usual practice to improve the fertilization to the crop, as verified during the site visit at the Sítio São João Lote 07 Qda. 28, Granjas Piaseski, Sítio Palmeiras-Lote 56 and Granja Chapadão swine farms /36/-/38/ and based on DNV's experience with swine production in Brazil. This is the only possible application to the use of effluent and stabilized sludge for crops irrigation, since to drain the effluent into a river is not in compliance with environmental regulations and the effluent is a good fertilizer for crop.

In the absence of the CDM project activity, the existing facility would continue to emit methane to the atmosphere at historical average levels.

The assessment of the project's compliance with the applicability criteria of AMS-III.D version 17 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

The project activity recovers methane generated in the treatment of swine manure by installing methane recovery and combustion systems. The project boundary includes the GHG emissions that come from the animal waste practices, including the GHG resulting from the capture and combustion of biogas.

As there is the future possibility to install electricity generator for in site electricity supply, this component is also included within the project boundary.

	GHGs involved	*Description*
Baseline emissions	*CH_4*	*Methane emissions from emissions from the management system of the swine's manure originated from the open lagoons (esterqueira)*
Project emissions	*CH_4*	*Fugitive methane emissions through capture inefficiencies of the biogas capture and combustion system.*
Leakage	*N/A*	*There are no leakages that need to be considered in applying* AMS-III.D version 17) *methodology.*

The identified boundary and selected sources and gases are justified for the project activity. 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 AMS-III.D version 17.

4.5 Baseline identification

In Brazilian swine farms, the environment legislation restricts discharging the manure into the water bodies. The common practice is to use anaerobic open lagoon, since the cost of biodigester is very high for swine farmers. The swine farmers therefore prefer to invest in increasing swine production, rather than in a project for capturing and destroying the methane gas.

The baseline is the emissions of methane from anaerobic decay of swine manure, calculated in accordance with the most recent IPCC tier 2 approaches (IPCC 2006 Guidelines). The IPCC default values for the parameters B_0 and VS were applied for Western Europe /6/ /7/. This is adequate as the main races used in Brazil for industrial purposes /30/ are of Western European bread due to the easy management and high quality of meat, as described by Brazilian Association for Swine Culture /27/ and as verified trough reviewing the receipts /6/ for sow

purchase from Agrocerespic, the Brazilian joint venture from Agroceres and Pig Improvement Co. from UK /30/.

The MCF for open lagoon and ambient temperature for Brazil Central has been chosen from table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories according to INPE (National Institute of Space Research) for Mato Grosso do Sul State annual average temperature /26/.

The project is designed to be independent concerning electricity consumption. The biogas flow meter selected was thermal mass flow type. The electricity for the electronic monitoring control system is supplied from batteries charged by solar panels. The project design does not require any blowers and the manure is gravity fed to the digester.

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 and 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

The additionality of the project is demonstrated by applying requirements stipulated in the Attachment A to the Appendix B of the simplified modalities and procedures for CDM small-scale project activities.

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

The starting date of the project activity is expected to be 15 June 2011, the date of signing the construction agreement for the first farm. The validation started on 5 September 2009 when the PDD was published for global stakeholder consultation. Thus, in accordance with EB 48 Annex 61 for new project activities, since the PDD has been published for global stakeholder consultation before the project activity start date, it is not necessary to notify the host Party DNA and the UNFCCC secretariat.

Moreover, already in June 2007 a Letter of Intent was signed between Ecoprogresso and Brascarbon for purchasing the emissions reductions from methane avoidance of swine manure projects which clearly demonstrates that CDM has been considered prior to the decision to go ahead with the project.

It is DNV's opinion that the proposed CDM project activity complies with the requirements of the latest version of the guidance on prior consideration of CDM.

4.6.2 Identification of alternatives to the project activity

Three alternative baseline scenarios to the project activity have been suitably identified and discussed.

Scenario 1: Installation of an open anaerobic lagoon (baseline scenario);

Scenario 2: Installation of an anaerobic digester plus flare;

Scenario 3: Installation of the an anaerobic digester plus flare and installation of 40 kW generators for utilization of biogas for generation of electricity.

4.6.3 Investment barriers

Choice of approach

The project applies NPV analyses considering the investment of installing biodigesters, flares and electricity generators and the O&M costs for a scenario without and with generation of electricity. The scenario with electricity generation conservatively assumes utilization of 100% of biogas for electricity generation. All farms were analyzed proportionally to the swine population and consequent biodigester size.

Discount rate selection

The basis for the discount rate is the SELIC rate set by the Central Bank of Brazil (http://www.bcb.gov.br) /32/. The chosen discount rate of 11.67% considered for 21 years represents the average SELIC rate updated to March/April 2011 as appropriateness of the input values with foreseen project starting date expected to be 15 June 2011. This date was considered reasonable according to para 06 of "Guidelines on the assessment of investment analysis" /22/ since the project was not yet implemented.

Input parameters

DNV has compared the main input parameters used in the financial analyses with the data reported for other similar projects recovering methane in animal manure management systems in Brazil (investment costs, applicable electricity tariff and operation and maintenance costs (O&M)) /35/. The assumed investment for the electric generator and the price of electricity saved was verified by comparing the values with similar 40 kW electric generator as BRL 128 560 is according to the budget provided by the project participant and the electricity price as BRL 209.33/MWh was further cross-checked with rural price of electricity in central region Brazil where the project will be implemented /27/. In addition to this, based on sectoral competence, DNV confirms that the input parameters used in the financial analysis are reasonable and adequately represent the economic situation of the project /5/.

Calculation and conclusion

The NPV calculations summarised in the PDD were provided in a excel spreadsheet /3/. The simple cost analysis considered for the scenario of simple capture and flaring demonstrated that the project has negative NPV.

For the scenario where the swine farm implements an electricity generator to supply the internal demand, the project involves a minimum investment of US$ 150 321 (investment cost for Chácara Jateí Lote 45 Farm). The NPV analysis of the implementation of methane recovery system in the farms encompassed by the project demonstrates that such an investment is not financially attractive.

The NPV values calculated with a discount rate of 11.67% indicate negative NPV values as showed in the table below.

Farm/Site	*Scenario 1: Anaerobic open lagoon*	*Scenario 2: Digester + flare*	*Scenario 3: Digester + flare+ electricity generation*
Granjas Piaseski	-34 659	-132 320	-86 507

Lote Rural 12	-30 500	-118 458	-72 644
Chácara Jateí Lote 45	-28 421	-111 527	-65 713
Sitio Lote 23 Qda. 27	-32 579	-125 389	-79 576
Sitio Lote 11 Qda. 24	-28 421	-111 527	-65 713
Sitio Nossa senhora Aparecida	-28 421	-111 527	-65 713
Sitio Palmeiras - Lote 56	-20 794	-69 313	25 926
Sitio Lote 54 Qda. 10	-28 421	-111 527	-65 713
Granja Chapadão	-28 421	-111 527	-65 713
Sitio Lote 3 Qda. 27	-28 421	-111 527	-65 713
Fazenda Chapadão	-32 579	-125 389	-79 576
Sitio Lote 11 Qda. 27	-28 421	-111 527	-65 713
Sitio São João Lote 07 Qda. 28	-28 421	-111 527	-65 713

Sensitivity analysis

A sensitive analysis for the third scenario (digester + flare + electricity generation) considering variations of 10% in the total investments and electricity price demonstrates that this alternative has also a negative NPV when varying the total investment and electricity price within a reasonable range /3/.

It is thus demonstrated that neither the project activity nor the utilization of biogas for electricity generation are financially viable and as the open lagoons are complying with environment legislation and have the most financially attractive NPV and are thus the most likely baseline scenario.

4.6.4 Barrier analysis

- *Technological barrier*: The implementation of biodigesters instead of open anaerobic lagoons requires special expertise with respect to design of facility, operation and maintenance of flare and operational control of biodigesters (pressure, temperature, flow etc). This expertise is not common with swine farm managers, thus requiring support of external technicians, considering that it is an entirely different activity from swine growing. Hence, the project would not be implemented without external support to overcome the technical difficulties related to the monitoring program to maintain system performance levels.
- *Barrier due to prevailing practice.* The Brazilian environment legislation requires the swine farms, to implement proper treatment of manure, without discharge into water bodies /33/ and the common practice for treatment of effluents is the open lagoon which could avoid the water pollution and also produce fertilizer to be used on the crops /29/ /31/ /34/. The use of biodigester is not common due to the high investment and the specific

skill needed for its operation and maintenance as the anaerobic process to produce gas need proper chemical and biological control which is not commonly available among swine farm operators. This was verified during several verifications carried out by DNV in Brazil on implemented swine manure projects.

In Brazil, there are 700 000 swine farmers and only 2 000 with biodigester /29/. All the biodigesters in swine farms are being developed only as CDM projects /29/. There are currently no direct subsidies or promotional support for the implementation of manure management or capture and destroying biogas. As there are higher costs required to install biodigesters and flare /14/, than what would be represented by the baseline scenario, the project faces investment barriers compared with the usual practice of open anaerobic lagoons.

Given the above barriers, it is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions thus are additional to what would otherwise have occurred.

4.7 Monitoring

The project applies the approved monitoring methodology AMS-III.D (version 17) "*Methane recovery in animal manure management systems*" /19/.

According to AMS-III.D version 17, the monitoring consists of direct measurement of the amount of methane flared or fueled, and concerning leakage, no sources of emission were identified.

The project monitoring plan is in compliance with the monitoring methodology AMS-III.D (version 17).

It is DNV's opinion, that the project participant are able to implement the monitoring plan.

4.7.1 Parameters determined ex-ante

According to AMS-III.D version 17, the baseline emissions are calculated considering the estimated swine population hosted by each farm, and respective default values of MCF, VS and B_0 according to the 2006 IPCC Guidelines.

The parameters used for the emission reduction calculations that are available *ex ante* and listed in PDD include:

- Methane conversion factor for management system S, climate region K ($MCF_{S,K}$) as 79% considering the temperature for southeast region /26/ and according table 10.8 IPCC 2006 /24/;
- Fraction of manure handled in baseline animal manure management system "j". The poject will handle 100% of swine population.
- Default of daily volatile solid excreted ($VS_{default}$) by livestock category as 0.3 kg/animal/day for Market Swine (finishers, nursery, boars) and 0.46 kg/hd/day for Breeding Swine (gilts, sows), considering the genetic used on swine farms from Western Europe according to as according to IPCC 2006 Volume 4 (Agriculture) chapter 10 (Livestock) tables 10A-7 and 10A-8 /24/, and evidenced trough the genetic evidences /6/;

- Maximum methane production (B_0) as 0.45 $m^3CH_4/kgVS$ considering the genetic used on swine farms from Western Europe according to IPCC 2006 Volume 4 (Agriculture) chapter 10 (Livestock) tables 10A-7 and 10A-8 /24/, and evidenced trough the genetic evidences /6/;
- Default average animal weight of a defined population at the project site (W default) considering market swine as 50kg and breeding swine 198 kg, according IPCC 2006 and Western Europe genetic /6/ /29/;
- Model correction factor to account for model uncertainties in accordance with AMS-III.D (version 17).

4.7.2 Parameters monitored ex-post

Emission reduction calculations are transparently documented in accordance with AMS-III.D (version 17), and will be monitored and calculated ex-post. The data will be archived in electronic form and be kept for five years after the end of the last crediting period.

The parameters used for the *ex-post* emission reduction calculations and listed in the PDD version 05 include:

- Combustion temperature of the flare (T_f), according to Monitoring Operational Procedure POP-01, which will be measured through the continuous temperature registration in the programmable logic controller (PLC);
- Average swine weight (W_{site}) according to Operational Procedure POP-16;
- Inspection on the site considering the number of days that AWMS and methane capturing system are operational (nd_y) and relevant regulation and the infrastructure of the site according to Operational Procedure POP-02;
- Swine population ($N_{LT,y}$) according to Monitoring Operational Procedure POP-03;
- Biogas flared or used as a fuel in the year y ($BG_{burnt,y}$) according to Monitoring Operational Procedure POP-04.The project specifies the biogas produced will be measured by cumulative flow meter and reported monthly by the regional technician;
- Fraction of methane in the biogas ($W_{CH4,y}$) be measured through Biogas/Geotech /28/ at frequency established according statistical analyses in order to assure 95% confidence level according Monitoring operational procedure POP-05;
- Temperature of the biogas at ambient conditions (T_{biogas}) be measured through Biogas/Geotech /28/ according Monitoring operational procedure POP-06;
- Pressure of the biogas at operation conditions (P_{biogas}) be measured through Biogas/Geotech /28/ according Monitoring operational procedure POP-13, where the capture system of biogas from swine manure will operate without blower, and the biogas will be the measured at atmospheric pressure (1013 mb).
- Density of the methane combusted at operation conditions ($D_{CH4,y}$) according Monitoring Operational Procedure POP-07;
- Sludge soil application (Q_{DM}) according Monitoring operational procedure POP-09;
- Selection of the correct default Flare Efficiency (FE or $\eta_{flare,h}$) according to the combustion temperature of the flare (T_f) and Monitoring Operational Procedure POP-08 applying the programmable logic controller (PLC) which at flare operation above 500ºC will select a 90% for the hour with all temperature measurements above or equal to 500º

Celsius and 0% efficiency for the hour with any temperature measurements below 500º Celsius;;

- Comparison of the calculated emission reductions with the actual measured data ($ER_{y,ex-post}$) according to the operational procedure POP-17;
- Formulated Feed Rations (FFR) according operational procedure POP-14;
- Genetic source from annex I Party according operational procedure POP-15;
- Fraction of manure handled in project emissions in system "i", year "y" (MS%i,y) monitored through the annex attached at the operational procedure POP-02;
- Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h ($FV_{RG,h}$): Recover the data registered in the data logger (CLP) of the volume in the local control panel and calculate flow rate according to the operational procedure POP-04;
- Mass flow rate of methane in the residual gas in the hour h ($TM_{RG,h}$): To be calculated according to the "Tool to determine project emissions from flaring gases containing methane". An operational procedure POP 17 includes the instruction to the calculation;
- Volumetric fraction of methane content in the residual gas on dry basis ($fv_{CH4,RG}$) measured as 95% confidence level;
- Number of animals produced annually of type "LT" in year "y" ($N_{p,y}$), according operational procedure POP-03 /11/;
- Number of days animal is alive in the farm, in year "y" ($N_{d,y}$), according operational procedure POP-03 /11/.

The monitoring approaches are considered appropriate and effective and comply with AMS-III.D (version 17).

4.7.3 Management system and quality assurance

Responsibilities and authorities for project management, monitoring and reporting activities, measurement, training and reporting techniques and QA/QC procedures are defined. In addition, it was verified that Brascarbon, as responsible for operation of biogas capture and flaring and for the monitoring, have enough resources and skills to assure adequate operation and monitoring of the biodigesters and the biogas capture and flaring system.

Several operational procedures were implemented in order to assure adequate operation and monitoring /11/.

4.8 Algorithms and/or formulae used to determine emission reductions

Emission reduction calculations are transparently documented in the spreadsheet **/2/**, in line with AMS-III.D version 17 as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Therefore, the emission reductions of the proposed project are estimated as follows:

- Baseline emissions

$$BE_y = GWP_{CH4} * D_{CH4} * UF_b * \sum MCF_j * B_{o.LT} * N_{LT.y} * VS_{LT.y} * MS\%_{BL.J}$$

Baseline emissions consider the IPCC 2006 Tier 2 approach and applicable default values as defaults values of Tables 10A-7 10A-8 /24/.

The Baseline emissions consider the factor $MS\%_{Bl,j}$ as 100% of the manure will be handled per category T, system S and climate region k.

- Project emissions

$$PEy = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y}$$

The project activity emissions were calculated considering (a) the physical leakage from the system as 10% of maximum methane producing potential of the manure, (b) emission from flaring considering a default value of 90% for efficiency of flaring according to AMS-III.D and (c) emissions from electricity for the operation of the installed facilities. However, there are no emissions from electricity consumption of the project activity as the project activity is not expected to consume any grid electricity or electricity generated from fossil fuels.

In addition, as the project will not increment the transportation of effluent as the barns are connected directly with biodigester and the transport is done by gravity, nor include the activities of manure storage as the biodigester effluent is drained to existent lagoon and the use on crop is on same way as baseline activity and no increment of effluent handling is done, hence no project emissions were considered for these components.

No leakage effects are required to be considered for the project activity as per the methodology.

The baseline emission estimate can be replicated using the data and parameter values provided in the PDD and supporting files submitted for registration. The data sources mentioned have been verified by DNV.

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average *ex-ante* estimation of emission reduction conservatively calculated to be 55 926 tCO_2e per year for the selected first 7 years crediting period.

All assumptions and data used by the project participants are listed in the PDD version 05 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 version 05 . 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 project emissions, baseline emissions, leakage and emission reductions. All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD.

4.9 Environmental Impacts

As stated in the PDD version 05, the project activities will reduce negative environment impacts, like the population of flies, possible spread of disease and odor /8/. Also, the environmental licenses for each farm were presented by the Project Proponent.

4.10 Comments by Local Stakeholders

Local stakeholders, such as the City Hall, Chamber of Councilors, the environmental state and local agencies, State and Federal Ministry Public, Legislative Assembly, NGO's and local

community associations were invited to comment on the project, in accordance with the requirements of Resolution 7 of the Brazilian DNA. The invitation letters and the mail receipts were received from the project proponent /15/.

DNV considers the local stakeholder consultation carried out adequately.

4.11 Comments by Parties, Stakeholders and NGOs

The PDD version 1 of 16 January 2009 considering the AMS-III.D version 15 was made publicly available on UNFCCC website and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 5 September 2009 to 4 October 2009 /25/.

No comments were received during this period.

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	Table 2, Section A.4.1.
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	DNA of Brazil: Letter of Approval. 24 August 2010 DNA of Portugal: Letter of Approval 16 July 2010.
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	Table 2, Section A.4.1.
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	The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Brazil.
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	The Brazilian designated national authority for the CDM is the Comissão Interministerial de Mudança Global do Clima. The Portuguese designated national authority for the CDM is Comissão para as Alterações Climáticas.

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

Requirement	Reference	Conclusion
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	Brazil has ratified the Kyoto Protocol on 23 August 2002. Portugal has ratified the Kyoto Protocol on 31 May 2002.
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	Table 2, Section A.2.
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	Table 2, Section A.2.
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	Table 2, Section B.3.1
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	Table 2, Section B.4 to B.7
About small-scale project activities		
12. The proposed project activity shall meet the eligibility criteria for small scale CDM project activities set out in § 6 (c) of the Marrakech Accords and shall not be a debundled component of a larger project activity.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §12a,c	Table 2, Section A.5.
13. The proposed project activity shall confirm to one of the project categories defined for small scale CDM project activities and use the simplified baseline and monitoring methodology for that project	Simplified Modalities and Procedures for Small Scale CDM Project Activities	Table 2, Section A.5.

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

Requirement	Reference	Conclusion
category.	§22e	
14. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	Table 2, Section D.
About stakeholder involvement		
15. 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	Table 2, Section E.
16. 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	The PDD of 16 January 2009 was made publicly available on UNFCCC website and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 5 September 2009 to 4 October 2009 /25/. No comments were received during this period.
Other		
17. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	Table 2, Section B.1.1 and D.1.1
18. 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	Table 2, Section B.2
19. 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	Table 2, Section B.2
20. 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	Table 2, Section D

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

Table 2 Requirements Checklist

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A. General Description of Project Activity (VVM para 55-57) *The project design is assessed.*					
A.1.Project Boundaries (VVM para 78-80) *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial boundaries (geographical) clearly defined?	/1/	DR	The project activity is located in the Mato Grosso do Sul State, Brazil. Project participant is requested to revise the GPS coordinates mentioned in section A.4.1.1 of the PDD.	~~CL 1~~	OK
A.1.2. Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	/1/	DR	The project boundary is defined as the project boundary considers the GHG emissions that come from the animal waste practices, including the GHG resulting from the capture and combustion of biogas, in accordance with AMS-III.D version 17.		OK
A.2.Participation Requirements (VVM para 51-54, 125-127) *Referring to Part A, Annex 1 and 2 of the PDD as well as the CDM glossary with respect to the terms Party, Letter of Approval, Authorization and Project Participant.*					
A.2.1. Which Parties and project participants are participating in the project?	/1/	DR	The project participants are Brascarbon Consultoria, Projetos e Representação S/A of Brazil and Luso Carbon Fund - Fundo Especial de Investimento Fechado of Portugal. The Parties Brazil and Portugal meet all relevant participation requirements. No participating Annex I Party is yet identified.		OK
A.2.2. Do all participating Parties fulfil the participation requirements as follows:	/1/	DR			OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
	Brazil (host) / Portugal				
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.2.3. Do the letters of approval meet the following requirements?	/1/ /16/ /17/	DR			OK
	Brazil (host) / Portugal				
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.2.4. Have all private/public project participants been authorized by an involved Party?	/1/ /16/ /17/	DR	Yes. See A.2.3.		OK
A.2.5. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance.	/1/	DR	The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Brazil.		OK
A.3.Technology to be employed (VVM para 58-64) *Validation of project technology focuses on the project engineering, choice of technology and competence/*					

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maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.					
A.3.1. Does the project design engineering reflect current good practices?	/1/	DR	The installation of anaerobic digesters aims to treat the manure under controlled conditions as well as to capture and burn the methane generated by the decay of swine manure from the farms. The facility drains the overflow with lower organic content to the existing open lagoon, which stores the effluents. Effluents are normally used for crop irrigation. The project will flare the biogas, but in case of favourable conditions at the farms in the future, the biogas may be utilized to also generate electricity for own consumption in accordance with AMS-III.D version 17). Nonetheless, the PDD clearly states that if electricity will be generated, no CERs will be claimed from displacing grid electricity.		OK
A.3.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	/1/	DR	The implementation of biodigester instead of open lagoon needs special skills with respect to design of the facility and operation and maintenance of flare and operation control (pressure, temperature, flow etc). This skill is not common for swine farm managers and need support of external technicians. The project uses current available technology in the country for methane capture and destruction, however it is possible some farms want to invest to implement an electric generator to produce electricity to own consume. With regards to the electricity generation, the content of H_2S on biogas arouses severe corrosion on equipment, which needs the installation of specific filter and		OK

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			routine maintenance in order to assure the necessary lifetime of equipment.		
A.3.3. Does the project make provisions for meeting training and maintenance needs?	/1/	DR	Brascarbon have enough resources and skills to assure adequate operation and monitoring of the biodigesters and the biogas capture and flaring system. The follow procedures were implemented in order to assure adequate operation and monitoring: POP 1 Combustion Temperature Monitoring Tf POP 2 Rules of Town POP 3 Swine Population Counting POP 4 Biogas volume measuring Bg_{burnt} POP 5 Methane Contend Monitoring W_{ch4} POP 6 Biogas Temperature Monitoring POP 7 Methane Density - Dch_4 POP 8 Flare Efficiency Timetable Fey POP 9 Biodigestor Sludge Removal POP 12 General Maintenance POP 13 Biogas Pressure Monitoring POP 14 Swine Feed Formulation POP 15 Swine genetic source POP 16 Swine Weight POP 17 Ex-post yearly emission reductions		OK
A.4. Contribution to Sustainable Development *The project's contribution to sustainable development is assessed.*					
A.4.1. Has the host country confirmed that the project assists it in achieving sustainable development?	/1/ /16/	DR	DNA of Brazil: Letter of Approval 24 August 2010.		OK
A.4.2. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR	The project is expected to bring social, economic, technological and environmental benefits, thus		OK

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			contributing to sustainable development objectives of the Brazilian Government.		
A.5. Small scale project activity *Tit is assessed whether the project qualifies as small-scale CDM project activity*					
A.5.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM?	/1/	DR	The project applies the simplified baseline methodology for selected small-scale CDM project activity (AMS-III.D version 17) – "*Methane recovery in animal manure management systems"*		OK
A.5.2. Is the small scale project activity not a debundled component of a larger project activity?	/1/	DR	Although the project participant has other small scale projects with the same methodology, all farms included in these projects are at a distance of more than 1 km from the sites included in this project. The project includes farms in Mato Grosso do Sul State, at the municipality of Jateí. Only this PDD has farms in the municipality of Jateí. Hence, the project is not a de-bundled component of a larger project activity.		OK
B. Project Baseline (VVM para 81-88, 105-107) *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology (VVM para 65-76) *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.1. Does the project apply an approved methodology and the correct version thereof?	/1/	DR	The project applies the simplified baseline methodology for selected small-scale CDM project activity (AMS-III.D version 17) – "*Methane recovery in animal manure*		OK

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			management systems"		
B.1.2. Are the applicability criteria in the baseline methodology all fulfilled?	/1/ /2/ /9/ /18/ /25/ /27/ /31/	DR	The project meets the applicability criteria of AMS-III.D version 17 as it is demonstrated that: - The project activity recovers methane generated in the treatment of swine manure by installing methane recovery and combustion systems. The environmental legislation of Brazil does not permit discharge of effluent from swine farms to the water bodies **/33/**. The usual practice is to use the anaerobic open lagoon with methane emissions escaping to the atmosphere; - The livestock population in the 13 farms is managed under confined conditions. This was verified through reviewing the environment licenses of each farm **/8/**; - Manure or effluents generated after treatment in the anaerobic bio-digesters is not discharged into natural water resources. This was verified through reviewing the, applicable environment legislation **/33/** and the environment licenses of each farm **/8/**; - The annual average temperature of baseline site (Mato Grosso do Sul State) is 23 – 25 °C and hence higher than the methodology stipulated temperature of 5°C. This was verified through information available on INPE (National Institute of Space Research) web site **/26/**; - The retention time of waste in the anaerobic open lagoons has been demonstrated to be greater than 1 month, as verified through		

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			environmental licenses of each farm **/8/**. The depth of the open lagoons is greater than 1 meter, as verified through the site visit at the Sítio São João Lote 07 Qda. 28, Granjas Piaseski, Sítio Palmeiras-Lote 56 and Granja Chapadão swine farms and pictures provided by the project participant for the remaining sites **/13/**; - No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario as verified by pictures provided by the project participant for all farms **/13/**; - The project involves facilities to burn (flaring) all biogas generated by the digester; - The estimated emissions reductions of 55 926 tCO_2e are lower than the limit 60 kt CO_2 equivalent **/2/**; - The project involves the use of treated effluent for irrigation in farms and application of stabilized sludge on crops irrigation in farms, without any anaerobic conditions. The practice is to distribute the sludge over the field according the usual practice to improve the fertilization to the crop, as verified during the site visit at the Sítio São João Lote 07 Qda. 28, Granjas Piaseski, Sítio Palmeiras-Lote 56 and Granja Chapadão swine farms and based on DNV's experience with swine production in Brazil. This is the only possible application to the use of effluent and stabilized sludge for crops		

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			irrigation, since to drain the effluent into a river is not in compliance with environmental regulations and the effluent is a good fertilizer for crop. The applicability of the methodology should be clearly described and justified in section B.2 of the PDD. In addition, as per AMS-III.D, project participant is requested to demonstrate that the storage time of the manure after removal from the animals barns should not exceed 24 hours before being fed into the anaerobic digester. Moreover, project participant is requested to provide documented evidences in order to justify the applicability criteria.	~~CL 3~~	OK
B.2. Baseline Scenario Determination (VVM para 81-88, 105-107) *The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.*					
B.2.1. What is the baseline scenario?	/1/	DR	The baseline is the emissions of methane from anaerobic decay of swine manure in open anaerobic lagoons.		OK
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/1/	DR	Consideration of alternative scenarios is not required for small scale methodologies.		OK
B.2.3. Has the baseline scenario been determined according to the methodology?	/1/	DR	Yes. The baseline scenario been determined according to the methodology AMS-III.D version 17.		OK
B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	Yes.		OK

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B.2.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR	Yes.		OK
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	Yes.		OK
B.2.7. Have the major risks to the baseline been identified?	/1/	DR	Yes.		OK
B.3. Additionality Determination (VVM para 94-121) *The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.*					
B.3.1. Is the project additionality assessed according to the methodology?	/1/ /3/ /14/ /27/ /29/ /31/ /32/ /33/ /34/ /35/	DR I	The additionality of the project is demonstrated by applying the Attachment A to the Appendix B of the simplified modalities and procedures for CDM small-scale project activities. The additionality claims of the project are based on the following barriers: *Investment barrier*: In Brazil, there are 700 000 swine farmers and only 2 000 with biodigester. All the biodigesters in swine farms are being developed only as CDM projects. There are currently no direct subsidies or promotional support for the implementation of manure management or capture and destroying biogas. As there are higher costs required to install biodigesters and flare, than what would be represented by the baseline scenario, the project faces investment barriers compared with the usual practice of open anaerobic lagoons.		

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			o Identification of alternatives to the project activity Three alternative baseline scenarios to the project activity have been suitably identified and discussed. Scenario 1: Installation of an anaerobic digester plus flare; Scenario 2: Installation of an anaerobic digester plus flare and installation of an electricity generator for utilization of biogas; Scenario 3: Installation of the open anaerobic lagoons (baseline scenario). o Choice of approach The project evidences the NPV analyses considering the investment of biodigester and flaring installation and O&M for scenario without and with generation of electricity with biogas. All farms were analyzed proportionally to the swine population and consequent biodigester size. o Benchmark selection The basis for the discount rate is the SELIC rate set by the Central Bank of Brazil (http://www.bcb.gov.br). As stated in the PDD, the chosen discount rate of 12.75% considered for 21 years represents the SELIC rate on 4 March 2009. However, DNV was able to check that this value does not match with the	~~CAR 1~~	OK

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			value mentioned in the Central Bank of Brazil web site. In addition, the value applied is not valid at the time of taking the investment decision by the project participants (i.e. project start date 15 June 2011). o Input parameters DNV has compared the main input parameters used in the financial analyses with the data reported for other similar projects recovering methane in animal manure management systems in Brazil (investment costs, applicable electricity tariff and operation and maintenance costs (O&M)). The assumed investment for the electric generator and the price of electricity saved was verified by comparing the values with similar electric generator implemented in similar swine manure project in Brazil and the electricity price was further cross-checked with commercial price of electricity in Brazil. In addition to this, based on sectoral competence, DNV confirms that the input parameters used in the financial analysis are reasonable and adequately represent the economic situation of the project. o Calculation and conclusion The NPV calculations summarised in the PDD were provided in a excel spreadsheet. The simple cost analysis		

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			considered for the scenario of simple capture and flaring demonstrated that the project has negative result. For the scenario where the swine farm implements an electricity generator to supply the internal demand, the project involves an average investment above US$ 100 500. The NPV analysis of the implementation of methane recovery system in the farms encompassed by the project demonstrates that such an investment is not financially attractive. Documented evidences of the input data for the investment analysis need to be submitted to DNV for verification. The NPV values calculated with a discount rate of 12.75% indicate negative NPV values. o Sensitivity analysis A sensitive analysis for the second scenario (digester + flare + electricity generation) considering variations of 10% in the total investments and electricity price demonstrates that this alternative has still a negative NPV. It is thus demonstrated that neither the project activity nor the utilization of biogas for electricity generation are not financially viable. The open lagoons are complying with environment legislation and have the most financially attractive NPV and are thus the most likely		

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			baseline scenario. As verified by DNV, the financial analysis spreadsheet provided by project participant does not match with the NPV calculations summarised in the PDD. Project participant is requested to correct the PDD and excel spreadsheet. • *Technological barrier*: The implementation of biodigesters instead of open anaerobic lagoons requires special expertise with respect to design of facility, operation and maintenance of flare and operational control of biodigesters (pressure, temperature, flow etc). This expertise is not common with swine farm managers, thus requiring support of external technicians, considering that it is an entirely different activity from swine growing. Hence, the project would not be implemented without external support to overcome the technical difficulties. • *Barrier due to prevailing practice*. The Brazilian environment legislation requires the swine farms, to implement proper treatment of manure, without discharge into water bodies and the common practice for treatment of effluents is the open lagoon (esterqueira) which could avoid the water pollution and also produce fertilizer to be used on the crops. The use of biodigester is not common due to the high investment and the specific skill needed for its operation and maintenance as the anaerobic process to produce gas need proper chemical and		

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			biological control which is not commonly available among swine farm operators. This was verified during several verifications carried out by DNV in Brazil on implemented swine manure projects. Given the above barriers, it is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions thus are additional to what would otherwise have occurred.	~~CAR 2~~	
B.3.2. Are all assumptions stated in a transparent and conservative manner?	/1/ /3/ /14/ /27/ /29/ /31/ /32/ /33/ /34/ /35/	DR I	See B.3.1.	~~CAR 1~~ ~~CAR 2~~	OK
B.3.3. Is sufficient evidence provided to support the relevance of the arguments made?	/1/ /3/ /14/ /27/ /29/ /31/ /32/	DR I	See B.3.1.	~~CAR 1~~ ~~CAR 2~~	OK

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	/33/ /34/ /35/				
B.3.4. If the starting date of the project activity is before the date of validation, has sufficient evidence been provided that the incentive from the CDM was seriously considered in the decision to proceed with the project activity?	/1/	DR	The starting date of the project activity is expected to be 15 June 2011, the date of signing the construction agreement. The validation started on 5 September 2009 when the PDD was published for global stakeholder consultation.		OK
B.4. Calculation of GHG Emission Reductions – Project emissions (VVM para 89-93) *It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.4.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	The project emissions were calculated considering the emission from the system as 10% of baseline emissions and the flare efficiency of 90% according to AMS-III.D and (c) emissions from electricity for the operation of the installed facilities. However, there are no emissions from electricity consumption of the project activity.		OK
B.4.2. Have conservative assumptions been used when calculating the project emissions?	/1/	DR	See B.4.1.		OK
B.4.3. Are uncertainties in the project emission estimates properly addressed?	/1/	DR	See B.4.1.		OK
B.5. Calculation of GHG Emission Reductions – Baseline emissions (VVM para 89-93) *It is assessed whether the baseline emissions are stated*					

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according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.					
B.5.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /2/ /24/	DR	Emission reduction calculations are transparently documented in the spreadsheet, in line with AMS-III.D version 17. Baseline emissions consider the IPCC 2006 Tier 2 approach and applicable default values as defaults values of Tables 10A-7 10A-8. The Baseline emissions consider the factor MS%Bl,j as 100% of the manure will be handled per category T, system S and climate region k and on project emissions consider the MS% i,y as 90% of the manure be handled in system "i". The MCF for open lagoon and ambient temperature has been chosen according to INPE (National Institute of Space Research) for Mato Grosso do Sul State annual average temperature. However, the reference for the specific ambient temperature in the PDD is not coherent. Mato Grosso do Sul State is not located in the southwest region of Brazil. Project participant is requested to clarify it.	~~CL 4~~	OK
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1/ /2/ /24/	DR	See B.5.1.	~~CL 4~~	OK
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1/ /2/ /24/	DR	See B.5.1.	~~CL 4~~	OK

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B.6. Calculation of GHG Emission Reductions – Leakage (VVM para 89-93) *It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.6.1. Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	No leakage is applicable under the methodology.		OK
B.6.2. Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	See B.6.1.		OK
B.6.3. Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	See B.6.1.		OK
B.7. Emission emissions (VVM para 89-93) *The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.*					
B.7.1. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/1/	DR	The project is expected to reduce CO_2 emissions to the extent of 391 482 tCO_2e during the 7-years crediting period.		OK
B.8. Monitoring Methodology VVM para 122-124) *It is assessed whether the project applies an appropriate monitoring methodology.*					
B.8.1. Is the monitoring plan documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	The project applies the approved monitoring methodology AMS-III.D (version 17) "*Methane recovery in animal manure management systems*". Also, monitoring requirements specified in the methodology AMS-III.D. The	~~CL 5~~	OK

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			"Tool to determine project emissions from flaring gases containing methane" should be mentioned in section B.1 of the PDD. According to AMS-III.D version 17, the monitoring consists of direct measurement of the amount of methane flared or fueled, and concerning leakage, no sources of emission were identified.		
B.8.2. 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	All data will be kept until five years after the end of the crediting period.		OK
B.9. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
B.9.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/ /28/	DR I	The parameters used for the *ex-post* emission reduction calculations that are available and listed in PDD include: • Combustion temperature of the flare (T_f), according to Monitoring Operational Procedure POP-01, which will be measured through the continuous temperature registration in the programmable logic controller (PLC); • Inspection on the site considering relevant regulation and the infrastructure of the site according to Operational Procedure POP-02; • Swine population ($N_{LT,y}$) according to Monitoring Operational Procedure POP-03;		

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			• Average swine weight (W_{site}) according to Operational Procedure POP-16; • Biogas flared or used as a fuel in the year y ($BG_{burnt,y}$) according to Monitoring Operational Procedure POP-04. The project specifies the biogas produced will be measured by cumulative flow meter and reported monthly by the regional technician; • Fraction of methane in the biogas ($W_{CH4,y}$) be measured through Biogas/Geotech at frequency established according statistical analyses in order to assure 95% confidence level according Monitoring operational procedure POP-05; • Temperature of the biogas at ambient conditions (T_{biogas}) be measured through Biogas/Geotech according Monitoring operational procedure POP-06; • Pressure of the biogas at operation conditions (P_{biogas}) be measured through Biogas/Geotech according Monitoring operational procedure POP-06, where the capture system of biogas from swine manure will operate without blower, and the biogas will be the measured at atmospheric pressure (1013 mb). As verified during the site visit, the pressure of biogas will be monitored according Monitoring operational procedure POP-13 and not Monitoring operational procedure POP-06. Project participant is requested to		

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			clarify. • Density of the methane combusted at operation conditions ($D_{CH4,y}$) according Monitoring operational procedure POP-07; • Sludge soil application (Q_{DM}) according Monitoring operational procedure POP-09; • Selection of the correct default Flare Efficiency (FE or $\eta_{flare,h}$) according to the combustion temperature of the flare (T_f) and Monitoring Operational Procedure POP-08 applying the programmable logic controller (PLC) which at flare operation above 500ºC will select a 90% flare efficiency and otherwise 50% flare efficiency; • Comparison of the calculated emission reductions with the actual measured data ($ER_{y,ex\text{-}post}$) according to the operational procedure POP-17; • Formulated Feed Rations (FFR) according operational procedure POP-14; • Genetic source from annex I Party according operational procedure POP-15; • Fraction of manure handled in project emissions in system "i", year "y" monitored through the annex attached at the operational procedure POP-02. • Number of animals produced annually of type "LT" in year "y" and Number of days animal is alive in the farm, in year "y", according operational procedure POP-03.	~~CL 6~~	OK

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			The monitoring approaches are considered appropriate and effective and comply with AMS-III.D (version 17).		
B.9.2. Are the choices of project GHG indicators reasonable and conservative?	/1/ /28/	DR I	See B.9.1	~~CL 6~~	OK
B.9.3. Is the measurement method clearly stated for each GHG value to be monitored and deemed appropriate?	/1/ /28/	DR I	See B.9.1	~~CL 6~~	OK
B.9.4. Is the measurement equipment described and deemed appropriate?	/1/ /28/	DR I	See B.9.1	~~CL 6~~	OK
B.9.5. Is the measurement accuracy addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/ /28/	DR I	See B.9.1	~~CL 6~~	OK
B.9.6. Is the measurement *interval* identified and deemed appropriate?	/1/ /28/	DR I	See B.9.1	~~CL 6~~	OK
B.9.7. Is the *registration, monitoring, measurement* and *reporting* procedure defined?	/1/ /28/	DR I	See B.9.1	~~CL 6~~	OK
B.9.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/ /28/	DR I	See B.9.1	~~CL 6~~	OK
B.9.9. 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/ /28/	DR I	See B.9.1	~~CL 6~~	OK
B.10. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for*					

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reliable and complete baseline emission data over time.					
B.10.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/ /26/	DR I	According to AMS-III.D version 17, the baseline emissions are calculated considering the estimated swine population hosted by each farm, and respective default values of MCF, VS and B_0 according to the 2006 IPCC Guidelines. The parameters used for the emission reduction calculations that are available *ex ante* and listed in PDD include: • Default of daily volatile solid excreted for livestock category T as IPCC 2006 (Vs); • Methane conversion factor for management system S, climate region K ($MCF_{S,K}$) considering the temperature for southwest region. The reference for the specific ambient temperature in the PDD is not coherent. Mato Grosso do Sul State is not located in the southwest region of Brazil. Project participant is requested to clarify it; • Maximum methane production (B_0) according Western Genetic as IPCC 2006 and considering the Agroceres genetic source used by swine producers; • Default average animal weight of a defined population at the project site (W default) considering market swine as 50kg and breeding swine 198 kg, according IPCC 2006 and Western Europe genetic;	~~CL 4~~	OK
B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/1/ /26/	DR I	See B.10.1	~~CL 4~~	OK

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B.10.3. Is the measurement method clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/1/ /26/	DR I	See B.10.1	~~CL 4~~	OK
B.10.4. Is the measurement *equipment* described and deemed appropriate?	/1/	DR	The measurement equipments used for the monitoring purposes is identified and the applicable procedures established. See A.3.3		OK
B.10.5. Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR	The measurement accuracy is addressed for the various parameters. Procedures to deal with erroneous measurements were established. See A.3.3.		OK
B.10.6. Is the measurement *interval* for baseline data identified and deemed appropriate?	/1/ /26/	DR I	See B.10.1.	~~CL 4~~	OK
B.10.7. Is the registration, *monitoring*, *measurement* and *reporting* procedure defined?	/1/	DR	Procedures for the registration, monitoring, measurement and reporting of the parameters in the monitoring plan were identified. See A.3.3.		OK
B.10.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	Procedures for maintenance of the monitoring equipments and installations and the calibration frequency were identified. See A.3.3.		OK
B.10.9. 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	Procedures for day-to-day record handling, collection and archiving were identified. See A.3.3.		OK
B.11. Monitoring of Leakage *It is assessed whether the monitoring plan provides for*					

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
reliable and complete leakage data over time.					
B.11.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/	DR	Concerning leakage, no sources of emission were identified according to AMS-III.D version 17		OK
B.11.2. Are the choices of project leakage indicators reasonable and conservative?	/1/	DR	See B.11.1.		OK
B.11.3. Is the measurement method clearly stated for each leakage value to be monitored and deemed appropriate?	/1/	DR	See B.11.1.		OK
B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
B.12.1. Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR	The simplified monitoring methodology AMS-III.D version 17 and the Brazilian DNA do not require the monitoring of social and environmental indicators.		OK
B.12.2. Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	See B.12.1		OK
B.12.3. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR	See B.12.1		OK
B.13. Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are*					

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
addressed.					
B.13.1. Is the authority and responsibility of overall project management clearly described?	/1/	DR	Yes.		OK
B.13.2. Are procedures identified for training of monitoring personnel?	/1/	DR	Procedures for identification of training for the monitoring personnel are addressed in the PDD. See A.3.3.		OK
B.13.3. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR	Emergencies procedure has been identified with respect the leak of biogas on biodigester under the POP 12 GENERAL MAINTENANCE.		OK
B.13.4. Are procedures identified for review of reported results/data?	/1/	DR	Procedures for review of reported results/data and for corrective actions in order to provide more accurate future monitoring and reporting were established. See A.3.3.		OK
B.13.5. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR	See A.3.3.		OK
C. Duration of the Project/ Crediting Period (VVM para 99-100, 104) *It is assessed whether the temporary boundaries of the project are clearly defined.*					
C.1.1. Are the project's starting date and operational lifetime clearly defined and evidenced?	/1/	DR	The project starting date was on 15 June 2011 which will be the date of signing the construction agreement with an expected lifetime of 21 years. The project proponent is requested to provide documentary evidence of the starting date of the project as the earliest of implementation,	~~CL 2~~	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			construction and real action in line with the guidelines of EB 41. In addition, project participant is requested to describe in section C.1.1 of the PDD the evidence available to support this date.		
C.1.2. Is the start of the crediting period clearly defined and reasonable?	/1/	DR	A 7-years renewable crediting period is selected (with the potential of being renewed twice), starting on 1 January 2012 or the date of registration project activity.		OK
D. Environmental Impacts (VVM para 131-133) *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.*					
D.1.1. Does host country legislation require an analysis of the environmental impacts of the project activity?	/1/ /8/	DR I	As stated in the PDD, the project activities will reduce negative environment impacts, like the population of flies, possible spread of disease and odor.		OK
D.1.2. Does the project comply with environmental legislation in the host country?	/1/ /8/	DR I	See D.1.1.		OK
D.1.3. Will the project create any adverse environmental effects?	/1/ /8/	DR I	See D.1.1.		OK
D.1.4. Have environmental impacts been identified and addressed in the PDD?	/1/ /8/	DR I	See D.1.1.		OK
E. Stakeholder Comments (VVM para 128-130) *The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.*					

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
E.1.1. Have relevant stakeholders been consulted?	/1/ /15/	DR I	Local stakeholders, such as the City Hall, Chamber of Councilors, the environmental state and local agencies, State and Federal Ministry Public, Legislative Assembly, ONG's and local community associations were invited to comment on the project, in accordance with the requirements of Resolution 7 of the Brazilian DNA. The invitation letters and the mail receipts were received from the project proponent. In addition all clarification meetings and commentaries were verified. Project participant is requested to explain why the meeting was held at São Gabriel do Oeste if this municipality is not included in the PDD.	~~CL 7~~	OK
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/ /15/	DR I	See E.1.1	~~CL 7~~	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/ /15/	DR I	See E.1.1	~~CL 7~~	OK
E.1.4. Is a summary of the stakeholder comments received provided?	/1/ /15/	DR I	See E.1.1	~~CL 7~~	OK
E.1.5. Has due account been taken of any stakeholder comments received?	/1/ /15/	DR I	See E.1.1	~~CL 7~~	OK

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

Table 2b: Additional requirements checklist for VVM version 1 (EB 44)

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.1. Letter of approval (VVM para 51-54, 125-127)					
A.1.1 Is the LoA received directly from the DNA or through the project participant.	/1/ /16/ /17/	DR	The copy of LoA of Brazil was provided by project participant. In addition, the Brazilian DNA confirmed the authenticity of the LoA through the status approved on website http://www.mct.gov.br/index.php/content/view/319063.html The LoA of Portugal was provided by project participant.		OK
A.2. Project design (VVM para 58-64)					
A.2.1 Does the PDD describe the CDM project activity with all relevant elements in a transparent and accurate way?	/1/		Yes, please see Table 2 A.3.1		OK
A.2.2 Has the CDM project activity at the start of the validation been constructed or does the CDM project activity use existing facilities or equipment?	/1/		No. The starting date of the project activity indicated in the PDD is expected to be 15 June 2011 the date of signing the Construction contract. Please see Table 2 C.1.1		OK
A.2.3 Is the project a large scale project, a small scale project with average annual emission reductions above 15 000 tonnes or a bundled small scale project? Has on-site visit been carried out?	/1/		Although the project participant has other small scale projects with the same methodology, all farms included in these projects are at a distance of more than 1 km from the sites included in this project. The project includes farms in Mato Grosso do Sul State, at the municipality of Jateí. Only this PDD has farms in the municipality of Jateí. Hence, the project is not a de-bundled component of a larger project activity.		OK
A.2.4 Does the project activity involved alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/		No, the entire project will use new equipment. Please see Table 2 A.3.1.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.3. Project emissions not addressed by the methodology					
A.3.1 Does the methodology describe all project emission source for the project activity that contributes all 1% of the emission reductions? Sources that the methodology considers not to take into account are not relevant (e.g. cement and iron consumption for building hydropower plants).	/1/		Yes. Please see Table 2 B.4 and B.5.		OK
A.4. Documentation of baseline emissions (VVM para 89-93)					
A.4.1 Documentation of the baseline determination: a. 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. b. All documentation is relevant as well as correctly quoted and interpreted. c. Assumptions and data can be deemed reasonable d. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. e. The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/1/		Yes. Please see Table 2- B.1.1, B.2.1, B.2.2 and B.5.		OK
A.5. Documentation of the calculations (VVM para 199-203)					
A.5.1 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 • 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	/1/		Yes, Please See Table 2 B.4 and B.5.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.					
A.6. Implementation of the monitoring plan (VVM para 122-124)					
A.6.1 How were the plans for implementation of the monitoring plan, data management, QA/QC procedures assessed? To what extent can the emission reductions achieved by the project by monitored ex-post and verified later by a DOE?	/1/		Yes, please see Table 2 B.8, B.9 and B.10.		OK
A.7. CDM consideration prior to starting date (VVM para 98-103)					
A.7.1 The prior consideration of CDM for the project activity complies with EB41 annex 46	/1/		Yes, Pease see Table 2 B.3.4.		OK

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CAR 1 As stated in the PDD, the chosen discount rate of 12.75% considered for 21 years represents the SELIC rate on 4 March 2009. However, DNV was able to check that this value does not match with the value mentioned in the Central Bank of Brazil web site. In addition, the value applied is not valid at the time of taking the investment decision by the project participants (i.e. project start date 15 June 2011).	B.3.1 B.3.2 B.3.3	New SELIC rate of 11.67% included in the PDD, having has reference the period between March to April of 2011, according to the 157th meeting of COPOM. Source: http://www.bcb.gov.br/?COPOMJUROS	Since the start date of the project activity changed to 15 June 2011, then, the discount rate should represent the average SELIC rate at the moment of revalidation. This approach is considered conservative as the project activity was not yet implemented. Therefore, this CAR is closed.
CAR 2 As verified by DNV, the financial analysis spreadsheet provided by project participant does not match with the NPV calculations summarised in the PDD. Project participant is requested to correct the PDD and excel spreadsheet.	B.3.1 B.3.2 B.3.3	The tables of PDD and the excel spreadsheet were corrected.	Ok. DNV checked the revised financial analysis spreadsheet and confirmed that NPV value is correctly calculated. Therefore, this CAR is closed.
CL 1 Project participant is requested to revise the GPS coordinates mentioned in section A.4.1.1 of the PDD.	A.1.1	All the GPS coordinates were revised.	Ok. DNV checked the revised PDD and confirms that GPS coordinates were all correct. Therefore, this CL is closed.
CL 2 The project proponent is requested to provide documentary evidence of the starting date of	C.1.1	Starting date in section C.1.1 and section B2, both are 15/06/2011 and updated in the PDD version 5. Brascarbon didn't started any	Ok. DNV checked the revised PDD version 05 and confirmed that the starting date of the project activity is expected to be 15 June 2011, the date of

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
the project as the earliest of implementation, construction and real action in line with the guidelines of EB 41. In addition, project participant is requested to describe in section C.1.1 of the PDD the evidence available to support this date.		construction at the moment and waits the preliminary validation report to get the approval of the investment to start the expenditures for the project.	signing the construction agreement. Therefore, this CL is closed.
CL 3 The applicability of the methodology should be clearly described and justified in the PDD. In addition, as per AMS-III.D, project participant is requested to demonstrate that the storage time of the manure after removal from the animals barns should not exceed 24 hours before being fed into the anaerobic digester. Moreover, project participant is requested to provide documented evidences in order to justify the applicability criteria.	B.1.2	This description of this information was imputed in section B.2. Evidences are according to the confined feed animal operations practices.	Ok. DNV checked the revised PDD and verified that all applicability criteria and respectively justification were included in section B.2. Therefore, this CL is closed.
CL 4 The reference for the specific ambient temperature in the PDD is not coherent. Mato Grosso do Sul State is not located in the southwest region of Brazil. Project participant is requested to clarify it	B.5.1 B.5.2 B.5.3 B.10.1 B.10.2 B.10.3 B.10.6	The region informed now in document is Central Region where the temperature range is 23 to 25 celsius degrees during the year, according to CPTEC/INPE/EMBRAPA and INMET http://bancodedados.cptec.inpe.br http://www.inmet.gov.br/html/clima.php	Ok. DNV was able to check the revised PDD version 05 and confirms that information about ambient temperature is correctly specified. Therefore, this CL is closed.
CL 5 The "Tool to determine project emissions from flaring gases containing methane"	B.8.1	This tool was included in section B.1.	Ok. DNV checked the revised PDD version 05 and observed that the Tool to determine project emissions from

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
should be mentioned in section B.1 of the PDD.			flaring gases containing methane was included in section B.1. Therefore, this CL is closed.
CL 6 As verified during the site visit, the pressure of biogas will be monitored according Monitoring operational procedure POP-13 and not Monitoring operational procedure POP-06. Project participant is requested to clarify.	B.9.1 B.9.2 B.9.3 B.9.4 B.9.5 B.9.6 B.9.7 B.9.8 B.9.9	The correct monitoring operational procedure to be use is the POP-13. This information was corrected in the section B.9.	Ok. The correct POP was included in the monitoring plan of the revised PDD. Therefore, this CL is closed.
CL 7 Project participant is requested to explain why the stakeholders' meeting was held at São Gabriel do Oeste municipality if this municipality is not included in the PDD.	E.1.1 E.1.2 E.1.3 E.1.4 E.1.5	All stakeholders were invited to comment the project activity according to the sent invitation cards. Protocols of the cards were sent to the validator. The presentation of the project activity was done at São Gabriel do Oeste for the PDD 5. The comments at the section E was excluded from the PDD.	Ok. DNV checked the revised PDD and observed that information about local stakeholders consultation meetings were removed from the PDD. DNV was able to confirm that local stakeholders were invited to comment on the project only by letters. Therefore, this CL is closed.

APPENDIX B

CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS

Luis Filipe Tavares

Mr. Luis Filipe Tavares holds a Technician's Degree in Chemistry and Bachelor's Degree in Metallurgical Engineering. Having an overall experience of thirty tree years.

Prior to joining DNV having around twenty tree years experience in steel production industry covering utilities (water, steam, wastewater treatment), environment control (atmosphere emissions, water emission and waste dumping).

His experience also covers the development of nitrification biological wastewater station as well as other activities as head of Utilities and Environmental Laboratory control.

He has also been actively involved in implementation of Management Systems such as ISO 9001 standard on coke oven department of steel industry as well as the ISO 140001 standard in all steel plant (the second steel company certified in the world) for more than three years.

He start on DNV as ISO 9001, ISO 14001 and OHSAS lead auditor, certifing numerous management systems during 7 years.

He has experience of around 8 years in validation and verification of numerous CDM projects in DNV, both in Brazil & South America.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in Iron and Steel; Metal production; Oil and Gas industry, CMM recovery and use; Generation from renewable energy sources; Waste handling and disposal and Animal waste management.

Andrea Leiroz

Mrs. Andrea Leiroz holds a Bachelor's Degree in Chemical Engineering, Master Degree in Material Science and Doctor Degree in Mechanical Engineering. Having an overall experience of around Thirteen years.

She has experience of around 4 years in validation and verification of numerous CDM projects in DNV, both in Brazil & abroad.

Her qualification, experience in CDM demonstrates her sufficient sectoral competence in Energy Generation from renewable energy sources, Waste handling and disposal and Animal waste management.

Juliana Scalon

Ms. Juliana Scalon holds a Bachelor Degree in Civil Enginnering having an overall experience of around 10 years. Prior to joining DNV having 5.5 years experience in waste handling and disposal service industry, covering technical operation and environment aspects of landfills and gas management, and 5 years experience in CDM consultancy services, responsible for the development of several Project Design Documents for landfill gas projects, project management on CDM projects of renewables, transport, and the development of greenhouse gas inventories for chemical industry.

She has joined DNV recently in the team for validation and verification of CDM projects/JI and other 3rd party validation/verification services.

Her qualification, industrial experience and experience in CDM demonstrate her sufficient sectoral competence in waste handling and disposal.

Gabriel Baines

Gabriel Baines holds a Bachelor's Degree in Environmental Engineering in the University of São Paulo (Brazil) and has done a short term course in the Environmental School of the University of Leeds (England), having an overall work experience of around 5 years. Prior to joining DNV, has had two and a half years experience in the aluminium industry covering the areas of production and environment. His experience also covers the fields of environmental management and management systems such as ISO 14.001.

He has experience of around 1 year in validation and verification of numerous CDM projects in DNV, both in Brazil and abroad.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in 9.1. metal production.

Fabiana Philipi

Holds a Degree in Environmental Engineering and has been working as a Greenhouse Gas – GHG Auditor in the Climate Change Services – CCS Business Area of Det Norske Veritas – DNV, since April 2009.

Since the end of 2006, Fabiana has been working with Green House Gas reduction projects. Her first experience was in the Brazilian Mercantile and Future Exchange, where worked in the intern position doing researches of the UNFCCC methodologies. After it, she moved to SGS where she participated of the validation and verification of CDM projects, including hydro and wind energy and landfill. Then she moved to Rio de Janeiro, where worked in Voltalia developing the PDDs (Project Design Documents) of the small hydro projects, assisting them until getting registered in the UNFCCC.

She is a bachelor of environmental engineering by the Escola Politecnica da Universidade de São Paulo. Her paper was the ”Economic viability of energy generation projects from renewable resources in Brazil in the CDM Programme”. She speaks Portuguese (native) and English.

Ramesh Ramachandran

Holds a Master’s Degree in Environmental Engineering and a Post Graduate Diploma in Operations Management.

Possesses a combined Indian & International experience of more than 15 years in the field of a) design and operation/maintenance of wastewater treatment (as part of working in wastewater design & equipment supply, firm), b) environmental consulting and c)production integrated environmental auditing. His experience also covers the fields of developing & designing EMS systems, resource/energy conservation, waste minimization and cleaner production in various manufacturing, process and chemical industries.

In DNV he has experience of more than 5 years in validation and verification of numerous CDM projects in DNV, both in India & abroad. He has also been involved as a Lead Auditor in Management System Audits such as ISO 9001, ISO 140001 and OHSAS 18001 standards in various industrial sectors for more than 5 years in DNV.

His qualification, industrial experience and experience in CDM demonstrate his sufficient sectoral competence in energy generation from renewable energy sources , electrical distribution, waste handling and disposal and animal waste management.

Simon 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.

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, electricity distribution, waste handling and disposal and animal waste management.

He has also experience with verifying corporate greenhouse gas emissions and emission reductions from verifying the emissions of the Norwegian process, paper & pulp and oil & gas industry.

Earlier, he has managed DNV Research’s R&D activities with the objective to build and to enhance DNV's knowledge in the field of CO_2 capture and storage. He also conducted R&D to conclude on measuring systems and reporting formats necessary to accurately and trustworthy report greenhouse gas emission reductions, especially addressing uncertainties.

He also provided technical environmental advisory services to clients within the process industry, above all in the field of air emissions. Among others, he developed a methodology for Environmental Risk Assessment for accidental releases of chemicals.