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# VALIDATION REPORT

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## “BRASCARBON Methane Recovery Project BCA-BRA- 03, Brazil”

REPORT No. 2008-1452

REVISION No. 01

DET NORSKE VERITAS



# VALIDATION REPORT

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CERTIFICATION AS

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Date of first issue: 2008-09-25	Project No.: PRJC-87903-2008-CCS-BRA
Approved by: Trine Kopperud Head of Section	Organisational unit: Climate Change Services
Client: Brascarbon Consultoria, Projetos e Representação Ltda. & Luso Carbon Fund	Client ref.: Luiz Lasas and Paulo Caetano

**Project Name:** "BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil"  
**Country:** Brazil  
**Methodology:** AMS-III.D  
**Version:** 14  
**GHG reducing Measure/Technology:** "Methane recovery in animal manure management systems"  
**ER estimate:** 304 745 tCO<sub>2</sub>e over 7 years (43 535 tCO<sub>2</sub>e 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. In summary, it is DNV's opinion that the "BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil", as described in PDD of 25 June 2009, 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 14. DNV thus requests the registration of the project as a CDM project activity.

Prior to the submission of the final validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil and DNA of Portugal, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.

Report No.: 2008-1452	Date of this revision: 2009-07-02	Rev. No. 01
Report title: "BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil"		
Work carried out by: Luis Filipe Tavares, Adrea Leiroz, Fabiana Philipi		
Work verified by: Kumaraswamy Chandrashekara (Draft report), Michael Lehmann (Final report)		

Key words:

- ☒ No distribution without permission from the Client or responsible organisational unit  
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☐ Unrestricted distribution



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## VALIDATION REPORT

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### Abbreviations

B <sub>0</sub>	m <sup>3</sup> CH <sub>4</sub> /kg VS (capacity of volatile solid transformed to methane)
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH <sub>4</sub>	Methane
CL	Clarification request
CO <sub>2</sub>	Carbon dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MCF	Methane Conversion Factor (capacity of facility to produce methane)
NGO	Non-governmental Organisation
NPV	Net Present Value
ODA	Official Development Assistance
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change
VS	Volatile Solids produced daily per head



# VALIDATION REPORT

## TABLE OF CONTENTS

1	EXECUTIVE SUMMARY – VALIDATION OPINION .....	1
2	INTRODUCTION .....	2
2.1	Objective	2
2.2	Scope	2
3	METHODOLOGY.....	3
3.1	Desk Review of the Project Design Documentation	3
3.2	Follow-up Interviews with Project Stakeholders	5
3.3	Resolution of Outstanding Issues	6
3.4	Internal Quality Control	7
4	VALIDATION FINDINGS .....	8
4.1	Participation Requirements	8
4.2	Project Design	8
4.3	Baseline Determination	9
4.4	Additionality	10
4.5	Monitoring	13
4.6	Estimate of GHG Emissions	15
4.7	Environmental Impacts	16
4.8	Comments by Local Stakeholders	16
4.9	Comments by Parties, Stakeholders and NGOs	16

Appendix A: Validation Protocol

Appendix B: Certificates of Competence



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## VALIDATION REPORT

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### 1 EXECUTIVE SUMMARY – VALIDATION OPINION

*Det Norske Veritas Certification AS (DNV) has performed a validation of the “BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil”, located in the Minas Gerais 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 participants are Brascarbon Consultoria, Projetos e Representação Ltda. of Brazil and Luso Carbon Fund authorized by Portugal as Annex 1 Party. All Parties involved, i.e., Brazil and Portugal, meet the requirements to participate in the CDM.*

*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 14). 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.*

*By capturing and destroying biogas from swine manure, the project results in reductions of CH<sub>4</sub> 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 14). 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-03, Brazil”, as described in the revised project design document of 25 June 2009, 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 14). Hence, DNV will request the registration of the “BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil” as a CDM project activity.*

*Prior to the submission of the final validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil and DNA of Portugal, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development..*



# VALIDATION REPORT

## 2 INTRODUCTION

Brascarbon Consultoria, Projetos e Representação Ltda. & Luso Carbon Fund has commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the “BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil” project, located in the Minas Gerais 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.

The validation team consisted of the following personnel:

<i>Role/Qualification</i>	<i>Last Name</i>	<i>First Name</i>	<i>Country</i>	<i>Type of involvement</i>					
				Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	Expert input
CDM validator / technical team leader	Leiroz	Andrea	Brazil	x			x		
Sector expert	Tavares	Luis Filipe	Brazil	x	x	x			x
GHG Auditor	Philipi	Fabiana	Brazil			x			
Technical reviewer (Draft report)	Kumaraswamy	Chandrashekara	India					x	
Technical reviewer (Final report)	Lehmann	Michael	Norway					x	

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

### 2.1 Objective

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



## VALIDATION REPORT

monitoring methodology AMS-III.D (version 14) /24/. The validation team has based the validation on the recommendations in the Validation and Verification Manual. /24/.

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:

- /1/ Project Design Document for the “BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil”. Version 1 of 04 July 2008.
- /2/ Project Design Document for the “BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil”. Version 2 dated of 25 June 2009
- /3/ Emission reduction calculation: spreadsheet PDD 3 - CER AMS III D - V14 rev 4.
- /4/ Biodigester construction contract signed by Brascarbon and GPA Engenharia e Construções Ltda. On 10 July 2008 for Fazenda Santo Antônio, Granja Sol Nascente, Fazenda Paraíso, Fazenda Bela Vista.
- /5/ Sow purchase receipt from Agrocere, DanBred and Topigs
- /6/ Swine food formulation Agrocere [http://www.agroceresnutricao.com.br/principal\\_1024.jsp](http://www.agroceresnutricao.com.br/principal_1024.jsp)  
Swine food formulation DanBred [http://www.dbdanbred.com.br/br/orien\\_niveisnutricionais.asp](http://www.dbdanbred.com.br/br/orien_niveisnutricionais.asp)
- /7/ Methane analyzer [http://www.geotechenv.com/gem2000\\_plus.pdf](http://www.geotechenv.com/gem2000_plus.pdf)
- /8/ Agrocerepic <http://www.agrocerepic.com.br/quemsomos/index.html> (joint venture of Agrocere and Pig Improvement co from UK;  
[http://www.agroceresnutricao.com.br/principal\\_1024.jsp](http://www.agroceresnutricao.com.br/principal_1024.jsp)
- /9/ DB Danbred [http://www.dbdanbred.com.br/br/repro\\_matrizes.asp](http://www.dbdanbred.com.br/br/repro_matrizes.asp)  
<http://www.topigs.com.br/>
- /10/ Letter of Intend 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.
- /11/ Environment Impact Assessment of Brascarbon PDD 3 BCA.BRA.03
- /12/ Construction Schedule PDD 3: BCA-BRA-003
- /13/ POP 1 COMBUST. TEMPERATURE MONITORING Tf



## VALIDATION REPORT

POP 2 RULES OF TOWN  
 POP 3 SWINE POPULATION COUNTING  
 POP 4 BIOGÁS VOLUME MEASURING  $BG_{burnt}$   
 POP 5 METHANE CONTENT MONITORING  $W_{CH_4}$   
 POP 6 BIOGÁS 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 SWINE WHEIGHT  
 POP 14 SWINE FEED FORMULATION

- /14/ Annual average temperature: <http://satelite.cptec.inpe.br/PCD/>  
<http://br.weather.com/weather/climatology/BRXX0018>
- /15/ ECOGAS enclosed flare specification
- /16/ Methane analyzer [http://www.geotechenv.com/gem2000\\_plus.pdf](http://www.geotechenv.com/gem2000_plus.pdf)
- /17/ Electricity Price in Brazil <http://www.aneel.gov.br/area.cfm?idArea=493&idPerfil=4>
- /18/ Brazilian Swine Producers Association  
[http://www.abcs.org.br/portal//mun\\_sui/producao/genetica/principais.jsp](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>
- /19/ Brazilian swine producers and CDM developers  
<http://www.sadia.com.br/br/instituto/>  
<http://www.perdigao.com.br/empresasperdigao/instituto1.cfm?codigo=15>  
<http://www.agcert.com/>  
<http://www.ecobiocarbon.com.br/>
- /20/ Brazilian government loan - SELIC  
<http://www.receita.fazenda.gov.br/Pagamentos/jrselic.htm>
- /21/ Brazilian Water Environment Legislation  
<http://www.mma.gov.br/port/conama/res/res05/res35705.pdf>
- /22/ Practice of swine manure treatment  
[http://www.cnpsa.embrapa.br/down.php?tipo=publicacoes&cod\\_publicacao=186](http://www.cnpsa.embrapa.br/down.php?tipo=publicacoes&cod_publicacao=186)
- /23/ EB 44 Report Annex 3: Validation and Verification Manual Version 01.  
[http://cdm.unfccc.int/EB/044/eb44\\_repan03.pdf](http://cdm.unfccc.int/EB/044/eb44_repan03.pdf)
- /24/ 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 14.
- /25/ 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.
- /26/ 2006 IPCC Guidelines for National Greenhouse Gas Inventories – Volume 4 Chapter 10





## VALIDATION REPORT

/27/ [Tool to determine project emissions from flaring gases containing methane](#)

/28/ Financial analysis PDD 3 spreadsheet

/29/ Pictures of the farms provided by the project participants

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;
- Changes related to the CARs and CLs identified in the DNV's draft validation report.

### 3.2 Follow-up Interviews with Project Stakeholders

On 07 November 2008, DNV visited the Brascarbon head quarter, at Sao Paulo municipality, in order to assess the baseline and the implementation schedule for the project.

In order to verify that the manure management practise prior to the implementation of the project is open anaerobic lagoons and that the farms included in this project meet the applicability criteria of AMS-III.D, DNV reviewed the swine farms environment licenses and pictures of the anaerobic open lagoons, including evidences that the open anaerobic lagoons have depths greater than 1 meter. Moreover, DNV reviewed contracts and the chronogram for project construction. DNV performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review.

In addition, DNV visited Sitio São Benedito swine farm, included in the "BRASCARBON Methane Recovery Project BCA-BRA-02" and Granja Mercio Thomazzoni of the "BRASCARBON Methane Recovery Project BCA-BRA-01". These projects are part of the group of PDDs for similar projects submitted by Brascarbo/Ecoprogresso for validation. the two selected farms the biodigester and monitoring and flaring system were implemented.

The following representatives of the project participants were interviewed:

/30/ David Garcia – Ecoprogresso

/31/ Luiz Lasas - Brascarbon

/32/ Mercio Thomazzoni – Granja Mercio Thomazzoni

/33/ Antonio Ianni – Sitio São Benedito

The main topics of the interviews are summarized in the table below.

Organization	Topic
Ecoprogresso	• Additionality of the project
Brascarbon	<ul style="list-style-type: none"> <li>• Monitoring plan</li> <li>• Baseline emission estimation</li> <li>• Historic average swine population</li> <li>• Environmental Licenses/legal compliance</li> <li>• Stakeholders consultation process</li> </ul>
Sitio São Benedito and Granja Mercio Thomazzoni	<ul style="list-style-type: none"> <li>• Baseline scenario (open anaerobic lagoon)</li> <li>• Project implementation ( biodigester)</li> <li>• Operation and monitoring control (procedures)</li> </ul>



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## VALIDATION REPORT

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### 3.3 Resolution of Outstanding Issues

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

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

The validation protocol consists of 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-03, Brazil” 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) mistakes have been made with a direct influence on project results;
- ii) CDM and/or methodology specific requirements have not been met; or
- iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

A request for clarification (CL) may be used where additional information is needed to fully clarify an issue.



## VALIDATION REPORT

<b>Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities</b>				
<b>Requirement</b>	<b>Reference</b>	<b>Conclusion</b>		
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>This is either acceptable based on evidence provided (<b>OK</b>), a <b>Corrective Action Request (CAR)</b> of risk or non-compliance with stated requirements or a request for <b>Clarification (CL)</b> where further clarifications are needed.</i>		

  

<b>Validation Protocol Table 2: Requirement checklist</b>				
<b>Checklist Question</b>	<b>Reference</b>	<b>Means of verification (MoV)</b>	<b>Comment</b>	<b>Draft and/or Final Conclusion</b>
<i>The various requirements in Table 2 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the large-scale PDD template, version 03 - in effect as of: 28 July 2006. Each section is then further sub-divided.</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.</i>	<i>The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.</i>	<i>This is either acceptable based on evidence provided (<b>OK</b>), or a <b>corrective action request (CAR)</b> due to non-compliance with the checklist question (See below). A request for clarification (CL) is used when the validation team has identified a need for further clarification.</i>

  

<b>Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests</b>			
<b>Draft report clarifications and corrective action requests</b>	<b>Ref. to checklist question in table 2</b>	<b>Summary of project owner response</b>	<b>Validation conclusion</b>
<i>If the conclusions from the draft Validation are either a CAR or a CL, these should be listed in this section.</i>	<i>Reference to the checklist question number in Table 2 where the CAR or CL is explained.</i>	<i>The responses given by the project participants during the communications with the validation team should be summarised in this section.</i>	<i>This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".</i>

**Figure 1 Validation protocol tables**

### 3.4 Internal Quality Control

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



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## VALIDATION REPORT

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### 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 project design documentation of 25 June 2009 /2/.

#### 4.1 Participation Requirements

Brascarbon Consultoria, Projetos e Representação Ltda. is the project participant from the Host party Brazil and Luso Carbon Fund 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 for the CDM. Brazil has ratified the Kyoto Protocol on 23 August 2002 and Portugal on 31 May 2002. The Brazilian designated national authority for the CDM is the Comissão Interministerial de Mudança Global do Clima. The Portuguese DNA is the Casa do Ambiente e do Cidadão, Ministry of Environment, Spatial Planning and Regional Development.

Prior to the submission of the final validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil and DNA of Portugal, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.

#### 4.2 Project Design

The “BRASCARBON Methane Recovery Project BCA-BRA-03, Brazil” consists of the implementation of anaerobic digesters in 16 farms located in the Minas Gerais 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 existing open lagoon, which stores the effluents. Effluents are normally used for crop irrigation.

The project will only flare the biogas, but in case of favourable conditions at the farms in the future, biogas could also be utilized to generate electricity for own consumption (in accordance with AMS-III.D version 14). Nonetheless, the PDD 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 starting date of the project activity is 10 July 2008, which is the date of signing the Construction contract by Brascarbon and GPA Engenharia e Construções Ltda for the farms Fazenda Santo Antônio, Granja Sol Nascente, Fazenda Paraíso, Fazenda Bela Vista /4/. DNV has verified the documents and considers that the choice of starting date is appropriate and in line with the guidelines of EB 41. The project has an expected operational lifetime of 21 years.

A 7-years renewable crediting period is selected (with the potential of being renewed twice), starting from 01 September 2009 or the date of registration project activity with an expected operational lifetime of 21 years.



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## VALIDATION REPORT

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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 current sites. The present PDD has farms at Patos de Minas, Uberlandia, Perdizes and Pres Olegario municipalities, at Minas Gerais State. Only the PDD “BRASCARBON Methane Recovery Project BCA-BRA-01” has farms at Minas Gerais State, but at the municipality of Santa Juliana municipality, distant around 30 km. Hence the project is not a de-bundled component of a larger project activity.

### 4.3 Baseline Determination

The project applies the simplified baseline methodology for selected small-scale CDM project activity AMS-III.D (version 14) – “*Methane recovery in animal manure management systems*”.

The project meets the applicability criteria of AMS-III.D (version 14) as it is demonstrated that:

- The project recovers methane generated from the treatment of swine manure by installing methane recovery and combustion systems. The environment legislation of Brazil does not permit discharge of effluent from swine farms to the water bodies. The usual practice is to use the anaerobic open lagoon with methane emissions escaping to the atmosphere;
- The livestock population in the 16 farms is managed under confined conditions. This was verified through reviewing the environment impact assessment /11/;
- 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 /21/ and the environment impact assessment /11/;
- The annual lower average temperature of baseline site (Minas Gerais State) is 18 °C and hence higher than the methodology stipulated temperature of 5°C. This was verified through information available on INPE (National Institute of Especial Research) and Weather Channel web site /14/;
- The retention time of waste in the anaerobic open lagoons has been demonstrated to be greater than 1 month, as verified through environmental impact assessment /11/. The depth of the open lagoons is greater than 1 meter, as verified through the pictures provided by the project participant for the sites /29/ and the site visit at the Sitio São Benedito swine farm, included into the PDD BRASCARBON Methane Recovery Project BCA-BRA-02, and Granja Mercio Thomazzoni of PDD BRASCARBON Methane Recovery Project BCA-BRA-01, which are part of the group of PDDs submitted by Brascarbo/Ecoprogresso;
- 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 /29/;
- The project involves facilities to burn (flaring) all biogas generated by the digester;
- The estimated emissions reductions of 43 535 tCO<sub>2</sub>e are lower than the limit 60 kt CO<sub>2</sub> equivalent /3/;



## VALIDATION REPORT

- 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 Sitio São Benedito swine farm and Granja Mercio Thomazzoni 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.

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/. This is adequate as the main races used in Brazil for industrial purposes /8/ are of Western European breed due to the easy management and high quality of meat, as described by Brazilian Association for Swine Culture /18/ and as verified through reviewing the receipts /5/ for sow purchase from Agrocerespic, the Brazilian joint venture from Agroceres and Pig Improvement Co. from UK /8/, DB Danbred and Topigs /9/.

The MCF for open lagoon and ambient temperature for Brazil South and Southeast has been chosen according to INPE and Weather Channel for Minas Gerais State annual average temperature /14/.

The project is designed to be independent concerning electricity consumption. The biogas flow meter selected was thermal mass in order to avoid pressure and assure the maximum flow. The electronic monitoring control system is supplied from solar panel and battery.

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.

### 4.4 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.

#### 4.4.1 CDM consideration and continued action to secure CDM status

The serious consideration of CDM prior to project start and subsequent real actions are evidenced by the Letter of Intent dated 01 June 2007 /10/ 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.

The starting date of the project activity was 10 July 2008, the date of signing the construction agreement /4/. The validation started on 28 August 2008 when the PDD was published for





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## VALIDATION REPORT

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global stakeholder consultation. At the time of completion of the validation report, the biodigester had concluded the construction as evidenced by the construction schedule /12/.

### 4.4.2 Investment barriers

In Brazil, there are 700 000 swine farms and only 2 000 with biodigester /18/. All the biodigesters at swine farms are being developed as CDM projects /19/. 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 /15/, than what would be represented by the baseline scenario, the project faces investment barriers compared with the usual practice of open anaerobic lagoons.

- 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: Electricity cogeneration and anaerobic digester plus flare installation;

Scenario 3: Installation of the open anaerobic lagoons (baseline scenario).

- Choice of approach

The project applies a NPV analyses considering the investment for the biodigester and flaring installation and O&M costs without and with generation of electricity with biogas. All farms were analyzed proportionally to the swine population and consequent biodigester size.

- Benchmark selection

The basis for the discount rate is the SELIC rate set by the Central Bank of Brazil (Brazilian Bonds – Average Selic Tax of July 2007 to June 2008 - <http://www.bcb.gov.br>) /20/. The chosen discount rate considered of 12.13% for 21 years represents the SELIC rate when the project participant decided to implement the project.

- 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 /17/. 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.

- Calculation and conclusion

The NPV calculations summarised in the PDD were provided in a excel spreadsheet /28/. The simple cost analysis 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\$ 130 000.



## VALIDATION REPORT

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 12.17% indicate a negative NPV value as showed in the table below:

FARM/SITE	NPV (1st SCENARIO) DIGESTER + FLARE	NPV (2nd SCENARIO) DIGESTER + FLARE + CO- GENERATION	NPV (3rd SCENARIO) ANAEROBIC OPEN LAGOON
Faz. Lanhosos e Barreiro	-126.854	-134.823	-15.285
Fazenda Estiva	-126.854	-134.823	-19.086
Fazenda Campo Alegre	-150.390	-158.359	-22.348
Faz. Bela Vista-Saraiva	-150.390	-158.359	-22.351
Faz. Barreiro - Miguel	-221.443	-229.412	-23.263
Fazenda Santa Juliana	-140.049	-148.018	-19.949
Faz. Santo Antonio	-241.743	-249.711	-32.575
Faz. Barreiro-Belchior	-144.595	-152.564	-19.753
Fazenda Caixeta	-156.185	-164.154	-23.985
Fazenda Lageado	-150.346	-158.314	-16.782
Faz. Paraíso	-126.854	-134.823	-15.833
Faz. Da Lagoa	-136.661	-144.630	-19.378
Granja Sol Nascente	-172.321	-180.290	-19.479
Faz. Dona Alice	-188.368	-196.337	-24.219
Faz. Capão Grosso	-153.867	-161.836	-21.972
Granja Dona Alzira	-158.414	-166.383	-22.572

### ○ Sensitivity analysis

A sensitive analysis considering variations of 10% in the total investments and electricity price demonstrates that the project has still a negative NPV /28/.

It is thus demonstrated that the project activity is not financially viable and as the open lagoons are complying with environment legislation, the swine farms is not requested to capture and destroy the biogas produced by the decay of manure.

- *Technological barrier:* The implementation of biodigesters instead of open anaerobic lagoons requires special expertise with respect to design of facility, operation and





## VALIDATION REPORT

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 /21/, and the common practice for treatment of effluents is the open lagoon (esterqueira) which avoids water pollution and also produce fertilizer to be used on the crops /18//19/. 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.

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.

### 4.5 Monitoring

The project applies the approved monitoring methodology AMS-III.D (version 14) “Methane recovery in animal manure management systems” and the monitoring requirements specified in the methodological “*Tool to determine project emissions from flaring gases containing methane*” /27/.

According to AMS-III.D version 14, the monitoring consists of direct measurement of the amount of methane flared or fuelled. Concerning leakage, no sources of emission were identified.

#### 4.5.1 Parameters monitored ex-ante

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 /14/;
- Maximum methane production ( $B_0$ ) according Western Genetic as IPCC 2006 and considering the Agroceres, Danbred and Topigs genetic source used by swine producers /8/ /9/ /5/
- 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 /8/ /9/ /5/.

#### 4.5.2 Parameters monitored ex-post

Emission reduction calculations are correct and transparently documented in accordance with AMS-III.D (version 14), 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.



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## VALIDATION REPORT

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The parameters used for the emission reduction calculations that are available *ex post* 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 ( $NLT,y$ ) according to Monitoring Operational Procedure POP-03;
- 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 ( $WCH_4,y$ ) be measured through Gem2000/Landtec /7/ 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 Gem2000/Landtec /7/ according Monitoring operational procedure POP-06;
- Pressure of the biogas at atmospheric conditions ( $P_{biogas}$ ) be measured through Gem2000/Landtec /7/ 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);
- Density of the methane combusted at room temperature and 1013 mbar pressure ( $D_{CH_4,y}$ ) 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-010 applying the programmable logic controller (PLC) which at flare operation above 500°C will select a 90% flare efficiency and otherwise 50% flare efficiency;
- Comparison of the baseline with the actual measured data ( $ERY_{ex-post}$ ) according to the operational procedure POP-17;
- Formulated Feed Rations (FFR) according operational procedure POP-18;
- Genetic source from developed country 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.
- Volumetric flow rate of the residual gas in dry basis at normal conditions in hour  $h$  according to the operational procedure POP-04;
- Mass flow rate of methane in the residual gas in the hour  $h$  calculation, calculated according instruction on operational procedure POP 17;
- Volumetric fraction of methane content in the residual gas on dry basis, measured at a frequency that will ensure a 95% confidence level, according operational procedure POP-05;



## VALIDATION REPORT

- 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 and computer system Pig-Champ or equivalent /8//9/;
- Electricity consumed from the grid by the project (kWh), although the design of biodigesters facilities is for autonomous operation, the project will measure possible electricity consumed if occurred.

The monitoring approaches are considered appropriate and effective and comply with AMS-III.D (version 14).

### 4.5.3 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 the operation of biogas capture and flaring and 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 /13/.

### 4.6 Estimate of GHG Emissions

Emission reduction calculations are transparently documented by the spreadsheet /3/, in line with AMS-III.D version 14 as followAMS-III.D:

$$ER_y = BE_y - PE_y - L_y$$

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

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

Baseline emissions consider the IPCC 2006 Tier 2 approach and applicable default values as defaults values of Tables 10A-7 10A-8 /26/

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”.

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y}$$

The project 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 the “Tool to determine project emissions from flaring gases containing methane” /27/ and (c) emissions from electricity for the operation of the installed facilities.

No leakage effects are required to be considered for the project activity as per the methodology. Hence leakage is taken as zero,  $L_y = 0$ .

The estimated amount of GHG emission reductions from the project is 304 745 tCO<sub>2</sub>e during the first crediting period (7 years).

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



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## VALIDATION REPORT

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mentioned have been verified by DNV.

### **4.7 Environmental Impacts**

As stated in the PDD, the project will reduce the environment impacts, like the population of lies, possible spread of disease and odour. Also, the environmental licenses for each farm were presented by the Project Proponent.

### **4.8 Comments by Local Stakeholders**

Local stakeholders, such as the City Hall, the environmental state and local agencies, and local community associations were invited to comment on the project, in accordance with the requirements of Resolution 1 of the Brazilian DNA. The invitation letters and the mail receipts were received from the PP. In addition all clarification meetings and commentaries were verified. All comments were about the specific technical issues and supporting the project.

### **4.9 Comments by Parties, Stakeholders and NGOs**

The PDD of 04 July 2008 was made publicly available on DNV's climate change website and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 28 August 2008 to 26 September 2008. No comments were received.

## APPENDIX A

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### CDM VALIDATION PROTOCOL

**Table 1 Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities**

Requirement	Reference	Conclusion
<b>About Parties</b>		
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	Prior to the submission of the final validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil and DNA of Portugal, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.
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	Prior to the submission of the final validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil and DNA of Portugal, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.
4. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country	Kyoto Protocol Art. 12.2, CDM Modalities and	Prior to the submission of the final validation report to the CDM Executive Board, DNV will have

Requirement	Reference	Conclusion
thereof.	Procedures §40a	to receive the written approval of voluntary participation from the DNA of Brazil and DNA of Portugal, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.
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 DNA is the Casa do Ambiente e do Cidadão, Ministry of Environment, Spatial Planning and Regional Development.
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.
1.1.1. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	Portugal calculated and recorded its assigned amount units.
1.1.2. The participating Annex I Party shall have in place a national system for	CDM Modalities and	Portugal has in place a national

Requirement	Reference	Conclusion
estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	Procedures §31b	registry and reported in June 2006 their 4 <sup>th</sup> communication.
<b>About additionality</b>		
8. 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
<b>About forecast emission reductions and environmental impacts</b>		
9. 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
<b>For large-scale projects only</b>		
10. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	Table 2, Section D.
<b>About small-scale project activities (if applicable)</b>		
11. 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.
12. 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 category.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22e	Table 2, Section A.5.



Requirement	Reference	Conclusion
13. 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.
<b>About stakeholder involvement</b>		
14. 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.
15. 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 04 July 2008 was made publicly available on DNV's climate change website and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 28 August 2008 to 26 September 2008. No comments were received until no.
<b>Other</b>		
16. 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
17. 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
18. 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
19. The project design document shall be in conformance with the UNFCCC CDM-PDD format.	CDM Modalities and Procedures Appendix B,	The project design document conforms to version 03 of the

Requirement	Reference	Conclusion
	EB Decision	CDM-SSC-PDD.
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

**Table 2 Requirements Checklist**

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<b>A. General Description of Project Activity</b> <i>The project design is assessed.</i>					
<b>A.1. Project Boundaries</b> <i>Project Boundaries are the limits and borders defining the GHG emission reduction project.</i>					
A.1.1. Are the project's spatial boundaries (geographical) clearly defined?	/1/	DR	The project activity is located in the Minas Gerais State, Brazil.		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 14.		OK
<b>A.2. Participation Requirements</b> <i>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.</i>					
A.2.1. Which Parties and project participants are participating in the project?	/1/	DR	The Project participants are Brascarbon Consultoria, Projetos e Representação Ltda. of Brazil MDL Project implementation company and Luso Carbon Fund (Shareholder of Climate Change Capital Limited) of Portugal. The host Party Brazil and the Annex I Party Portugal meet all relevant participation requirements.		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview  
CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.2.2. Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/1/	DR	Prior to the submission of the final validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil and DNA of Portugal, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.	—	--
A.2.3. Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/1/	DR	Yes, Brazil and Portugal fulfil all requirements of participation.  Brazil has ratified the Kyoto Protocol on 23 August 2002. The Brazilian DNA is the Comissão Interministerial de Mudança Global do Clima.  Portugal has ratified the Kyoto Protocol on 31 May 2002. The Portuguese DNA is the Casa do Ambiente e do Cidadão, Ministry of Environment, Spatial Planning and Regional Development.		OK
A.2.4. 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
<b>A.3. Technology to be employed</b> <i>Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.</i>					

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CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.3.1. Does the project design engineering reflect current good practices?	/1/	DR	The installation of anaerobic digesters aim 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 burn the biogas on initial approach, but in favorable conditions of farms in the future, they could also generate electricity for own consumption as paragraph 8 of AMS-III.D version 14 but however it is not clear if the project will claim CERs from this electricity.	<del>CL</del> 2	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 need 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 <sub>2</sub> S on biogas arouses severe corrosion on equipment,		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview  
CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			which needs the installation of specific filter and 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	<p>Brascarbon have enough resources and skills to assure adequate operation and monitoring of the biodigesters and the biogas capture and flaring system.</p> <p>The follow procedures were implemented in order to assure adequate operation and monitoring:</p> <p>POP 1 COMBUST. TEMPERATURE MONITORING Tf  POP 2 RULES OF TOWN  POP 3 SWINE POPULATION COUNTING  POP 4 BIOGÁS VOLUME MEASURING BG<sub>burnt</sub>  POP 5 METHANE CONTEND MONITORING W<sub>CH4</sub>  POP 6 BIOGÁS TEMPERATURE MONITORING  POP 7 METHANE DENSITY - DCH4  POP 8 FLARE EFFICIENCY TIMETABLE FEY  POP 9 BIODIGESTOR SLUDGE REMOVAL  POP 12 GENERAL MAINTENANCE  POP 13 SWINE WHEIGT  POP 14 SWINE FEED FORMULATION</p>		OK
<b>A.4. Contribution to Sustainable Development</b> <i>The project's contribution to sustainable development is assessed.</i>					
A.4.1. Has the host country confirmed that the project assists it in achieving sustainable development?	/1/	DR	<p>Prior to the submission of the final validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil and DNA of Portugal, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable</p>	—	--

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CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			development.		
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 contributing to sustainable development objectives of the Brazilian Government.		OK
<b>A.5. Small scale project activity</b> <i>It is assessed whether the project qualifies as small-scale CDM project activity</i>					
A.5.1. Does the project qualify as a small scale CDM project activity as defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM?	/1/		The project applies the simplified baseline methodology for selected small-scale CDM project activity AMS-III.D (version 14) – “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/		Although the project participant has another small scale project with the same methodology, all those farms are at a distance of more than 1 km from the project activity. Hence the project is not a de-bundled component of a larger project activity.		OK
<b>B. Project Baseline</b> <i>The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.</i>					
<b>B.1. Baseline Methodology</b> <i>It is assessed whether the project applies an appropriate baseline methodology.</i>					
B.1.1. Does the project apply an approved methodology	/1/	DR	The project applies the simplified baseline		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview  
CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
and the correct version thereof?			methodology for selected small-scale CDM project activity AMS-III.D (version 14) – “Methane recovery in animal manure management systems”.		
B.1.2. Are the applicability criteria in the baseline methodology all fulfilled?	/1/	DR	<p>The project meets the applicability criteria of AMS-III.D (version 14) as it is demonstrated that:</p> <ul style="list-style-type: none"> <li>- The swine population is managed under confined conditions;</li> <li>- The manure is stored on open lagoon for evaporation, according Brazilian environment legislation, which does not allow discharging of swine manure effluent on water bodies;</li> <li>- The annual average temperature of baseline site is higher than 5C as demonstrated to MCF applicable.</li> <li>- The practice manure storage time is around one year, and the depth of open lagoons is higher than 1 meter in order to support the practice.</li> <li>- The baseline scenario is the open lagoon without any methane recovery.</li> <li>- The project recovers methane generated from the treatment of swine manure by installing methane recovery and combustion systems. The usual practice is to use the anaerobic open lagoon with methane emissions escaping to the</li> </ul>		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview  
 CDM Validation Protocol – Report No. 2008-1452, rev. 01



CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			atmosphere; - The project involves facilities to burn (flaring) all biogas generated by the digesters.  The aggregate emissions reduction by the project activity is 7-years 304 745 tCO <sub>2</sub> e per year which is lower than the limit of 60 kt CO <sub>2</sub> equivalent per annum, for Type III small scale projects.		
<b>B.2. Baseline Scenario Determination</b> <i>The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.</i>					
B.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 IIID version 14..		OK
B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	Yes.		OK
B.2.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies,	/1/	DR	Yes.		OK

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 CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
macro-economic trends and political aspirations?					
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>B.3. Additionality Determination</b> <i>The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.</i>					
B.3.1. Is the project additionality assessed according to the methodology?	/1/	DR	<p>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.</p> <p>The additionality claims of the project are based on the following barriers:</p> <ul style="list-style-type: none"> <li><i>Investment barrier:</i> In Brazil, there are 700,000 swine farmers and only 2,000 with biodigester /18/, whereof all biodigesters are implemented as CDM project activities. There are currently no direct subsidies or promotional support for the implementation of manure management or capture and destroying biogas. There are higher costs required to</li> </ul>		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			<p>install biodigesters and flare /20/, than what would be represented by the baseline scenario, the project faces investment barriers compared with the usual practice of open anaerobic lagoons. The project evidences the NPV analyses considering the investment of biodigester and flaring installation and O&amp;M for scenario without and with generation of electricity with biogas. All farms were analyzed proportionally to the swine population and consequent biodigester size. The discount rate considered of 12.17% for 21 years is conservative since considering the Brazilian government loan (SELIC) of July 2008, when the project participant decide implement the project. The operation and maintenance cost reach around 16% of investment including beyond the operation, the monitoring and management project costs.</p> <p>As evidenced, all farms have a negative result with biodigester and electricity generator implementation justified mainly by the high investment of biodigester and electricity generator and low profit when use proper electricity or even null when only the capture and flaring activity is implemented. Hence, it is sufficiently demonstrated that the</p>		

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			<p>project faces an investment barrier</p> <ul style="list-style-type: none"> <li>• <i>Technological barrier:</i> The implementation of biodigesters instead of open anaerobic lagoons requires special expertise with respect to design of facility, operation and maintenance of flare and operation control (pressure, temperature, flow etc). This expertise is not readily available with the swine farm managers, thus require support of external technicians considering the different activity from swine growing. This argument is validated by DNV on the basis of experience in similar swine farms in Brazil.</li> <li>• <i>Barrier Due to Prevailing Practice.</i> The Brazilian environment legislation require swine farm activities to have proper treatment system for manure, without discharge it into water bodies. The common practice for treatment of effluent is the open lagoon (esterqueira) which could avoid the water pollution and also could produce fertilizer to be used on the crops. In Brazil, there are 700,000 swine farmers and only 2,000 with biodigester. The use of biodigester is not common due its high investment and the specific skill required as the anaerobic treatment system to produce gas involve the</li> </ul>		

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 CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			chemical and bacterial control which is not common on swine farmers.		
B.3.2. Are all assumptions stated in a transparent and conservative manner?	/1/	DR	See B.3.1.		OK
B.3.3. Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	See B.3.1.		OK
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 project proponent is requested to provide documentary evidence of the starting date of the project as the earliest of implementation, construction and real action in line with the guidelines of EB 41. Evidence also needs to be provided for serious consideration of CDM while deciding to proceed with the project	<b>CL4</b>	OK
<b>B.4. Calculation of GHG Emission Reductions – Project emissions</b> <i>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.</i>					
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 the “ <i>Tool to determine project emissions from flaring gases containing methane</i> ”/27/.		

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 CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			As the project will not use blowers and the pumps will be fueled with biogas, no electricity will be consumed by the farms.  As the PDD declare “ <i>The treated water is then recycled and sent back to the farms, or used for irrigation by the use of biogas or electrical stationary pumps</i> “ DNV request to explain in PDD why project emission on account of use of electricity for operation of the facility is not considered in the farms.	<del>CL</del> 4	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>B.5. Calculation of GHG Emission Reductions – Baseline emissions</b>  <i>It is assessed whether the baseline emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.</i>					
B.5.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	Emission reduction calculations are transparently documented by the spreadsheet /3/, and it is in line with AMS-III.D version 14.  Baseline emissions consider the IPCC 2006 Tier 2 approach and applicable default values as defaults values of Tables 10A-7 10A-8		

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CDM Validation Protocol – Report No. 2008-1452, rev. 01

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			<p><del>/26/</del> however the following need to be justified.</p> <p>(a) As per Serial no 13 of methodology, the Bo &amp; VS values applicable to developed country can be used subject to satisfying four conditions related to genetic source of production, use of formulated feed rations and project specific animal weight. Farm records to demonstrate that these conditions are satisfied at the project sites need to be provided, including genetic source</p> <p>Also justification to be provided for MCF value of 79 % and MS % <math>_{BL,j}</math>, value of 100% &amp; MS% <math>_{i,y}</math> values of 90%<sub>y</sub> used in ex-post emission reduction calculation</p>	<del>CAR1</del>	OK
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	See B.5.1.		OK
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	See B.5.1.		OK
<b>B.6. Calculation of GHG Emission Reductions – Leakage</b> <i>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.</i>					
B.6.1. Are the leakage calculations documented according to the approved methodology and in a	/1/	DR	No leakage is applicable under the methodology..		OK

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 CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
complete and transparent manner?					
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>B.7. Emission Reductions</b> <i>The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.</i>					
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 <sub>2</sub> emissions to the extent of 304 745 tCO <sub>2</sub> e during the 7-years crediting period.		OK
<b>B.8. Monitoring Methodology</b> <i>It is assessed whether the project applies an appropriate monitoring methodology.</i>					
B.8.1. Is the monitoring plan documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	The approved monitoring methodology AMS-III.D version 14 –“Methane recovery in animal manure management systems”, according 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 has been used. As per the monitoring requirements of AMS.III.D, version 14 and the	<b>CAR-2</b>	OK

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CDM Validation Protocol – Report No. 2008-1452, rev. 01



CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			<p>methodological tool to determine project emissions from flaring of gases containing methane, the following need to be included in the Monitoring Plan:</p> <p>(i) Manufactures specification for operation of the flare and the data and procedures to monitor is to be documented in PDD,( Refer serial No 26 of methodology and the methodological Tool to determine project emissions from flaring.)</p> <p>(ii)The system used for monitoring MS% i,y,” and, <math>W_{site}</math> &amp; <math>N_{LT,y}</math> are to be described in PDD ( as serial no.30 of AMS.IIID Version 14.).</p> <p>(iii) The genetic source of the livestock needs to be monitored. (as serial no 31(a) of Methodology).</p> <p>(iv) Onsite inspection of each farm for each verification period needs to be included. .(as serial no 33 of Methodology).</p> <p>(v) Determination of hourly mass flow rate of methane in the residual gas (TMRG,h) for arriving flare efficiency (refer Step 5 &amp; 6 of Tool) and monitoring of FVRG,h is not specifically included in the parameters to be monitored</p> <p>In addition, the PDD shall document the type of Flare (Open/closed) and the approach to determine flare efficiency. Since the PP is</p>		

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			<p>using default value for methane destruction efficiency, PDD shall document that manufacturer's specifications for the operation of the flare and the required data and procedures to monitor these specifications. Further, PDD needs to state that if any of the flare parameters are out of range, only 50% of default value shall be used for that hour.</p> <p>The monitoring of <math>MS\%_{iy}</math>, <math>nd_y</math>, Genetic source of the livestock and other Flare operating parameters needs to be included in the monitoring plan, as per requirement of methodology.</p> <p>Monitoring of <math>N_{da,y}</math> and <math>N_{p,y}</math> also needs to be included in the monitoring plan and procedure for <math>N_{LT,y}</math> determination clearly stated in the PDD.</p> <p>The procedure for <math>W_{site}</math> given in the monitoring plan is <i>Archive electronically + files, during project plus 5 years</i>. Procedure for the same shall be clearly identified in the PDD.</p>		
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>B.9. Monitoring of Project Emissions</b>					

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 CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>					
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/	DR	<p>The project emissions were calculated considering the emission from the system as 10% of baseline emissions and 90% efficiency of flare, according the “<i>Tool to determine project emissions from flaring gases containing methane</i>” /9/.</p> <p>The temperature of flare combustion will be measured on time of gas flaring. An installed PLC will assure the temperature above 500°C all the time of flaring. In case this temperature comes down, the PLC will close the exhaust valve. Records will be available on local PLC or computer data base.</p> <p>The following need to be included in the Monitoring Plan.</p> <p>(i) Manufactures specification for operation of the flare and the data and procedures to monitor is to be documented in PDD, as required under the methodological “<i>Tool to determine project emissions from flaring</i>”. Also see serial No 26 of methodology.</p> <p>(ii)The system used for monitoring <math>MS\%</math> <math>i,y</math>,” and, <math>W_{site}</math> &amp; <math>N_{LT,y}</math> are to be described in PDD( see serial no.30 of AMS.III.D,Version 14.).</p> <p>(iii) The genetic source of the livestock need to be monitored.(see serial no 31(a) of</p>	<del>CL-5</del>	OK

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 CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			Methodology). (iv) Onsite inspection of each farm for each verification period need to be included. .(see serial no 33 of Methodology). (v)Determination of hourly mass flow rate of methane in the residual gas ( $TM_{RG,h}$ ) for arriving flare efficiency (refer Step 5 & 6 of Tool) and monitoring of $FV_{RG,h}$ is not specifically included in the parameters to be monitored		
B.9.2. Are the choices of project GHG indicators reasonable and conservative?	/1/	DR	See B.9.1		OK
B.9.3. Is the measurement method clearly stated for each GHG value to be monitored and deemed appropriate?	/1/	DR	See B.9.1		OK
B.9.4. Is the measurement equipment described and deemed appropriate?	/1/	DR	See B.9.1		OK
B.9.5. Is the measurement accuracy addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR	See B.9.1		OK
B.9.6. Is the measurement <i>interval</i> identified and deemed appropriate?	/1/	DR	See B.9.1		OK
B.9.7. Is the <i>registration, monitoring, measurement and reporting</i> procedure defined?	/1/	DR	See B.9.1		OK

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CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.9.8. Are procedures identified for <i>maintenance</i> of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	See B.9.1		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/	DR	See B.9.1		OK
<b>B.10. Monitoring of Baseline Emissions</b> <i>It is established whether the monitoring plan provides for reliable and complete baseline emission data over time.</i>					
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/	DR	According to AMS-III.D version 14, the baseline emissions are calculated ex ante considering the estimated swine population hosted by each farm, and respective default values of MCF, VS and B <sub>0</sub> according to the 2006 IPCC Guidelines. However these figures were not justified. See B.5.1 and B.8.1	<del>CAR-1</del>	OK
B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/1/	DR	See B.10.1		OK
B.10.3. Is the measurement method clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/1/	DR	See B.10.1		OK
B.10.4. Is the measurement <i>equipment</i> described and deemed appropriate?	/1/	DR	The measurement equipments used for the monitoring purposes is identified and the applicable procedures established.		OK

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CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			See A.3.3		
B.10.5. Is the measurement <i>accuracy</i> 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 <i>interval</i> for baseline data identified and deemed appropriate?	/1/	DR	See B.10.1.		OK
B.10.7. Is the registration, <i>monitoring</i> , <i>measurement</i> and <i>reporting</i> procedure defined?	/1/	DR	Procedures for the registration, monitoring, measurement and reporting of the parameters in the monitoring plan are identified. See A.3.3		OK
B.10.8. Are procedures identified for <i>maintenance</i> 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 need to be established. 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 have not been identified. See A.3.3		OK
<b>B.11. Monitoring of Leakage</b> <i>It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.</i>					
B.11.1. Does the monitoring plan provide for the collection and archiving of all relevant data	/1/	DR	Concerning leakage, no sources of emission were identified according to AMS-III.D		OK

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CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
necessary for determining leakage?			Version14.		
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>B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts</b> <i>It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.</i>					
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 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>B.13. Project Management Planning</b> <i>It is checked that project implementation is properly prepared for and that critical arrangements are</i>					

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 CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<i>addressed.</i>					
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 is 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 were identified with respect to leak of biogas from biodigester and under the POP 12 GENERAL MAINTENANCE /13/.		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
<b>C. Duration of the Project/ Crediting Period</b> <i>It is assessed whether the temporary boundaries of the project are clearly defined.</i>					
C.1.1. Are the project's starting date and operational lifetime clearly defined and evidenced?	/1/	DR	The project starting date was on 10 July 2008 with an expected lifetime of 21 years. The project proponent is requested to provide documentary evidence of the starting date of	<del>CL1</del>	OK



CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			the project as the earliest of implementation, construction and real action in line with the guidelines of EB 41.		
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 01 September 2009 or the date of registration project activity.		OK
<b>D. Environmental Impacts</b> <i>Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.</i>					
D.1.1. Does host country legislation require an analysis of the environmental impacts of the project activity?	/1/	DR	As stated in the PDD, the project will reduce the environment impacts, like the population of lies, possible spread of disease and odor; however no comment was included about environment licenses of the farms. DNV requests documented evidences of the Environmental Licenses	<del>CL-6</del>	OK
D.1.2. Does the project comply with environmental legislation in the host country?	/1/	DR	Copy of environmental license of each site need to be provided. See D.1.1.		OK
D.1.3. Will the project create any adverse environmental effects?	/1/	DR	See D.1.1.		OK
D.1.4. Have environmental impacts been identified and addressed in the PDD?	/1/	DR	See D.1.1.		OK

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CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<b>E. Stakeholder Comments</b> <i>The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.</i>					
E.1.1. Have relevant stakeholders been consulted?	/1/	DR	<p>Local stakeholders, such as the City Hall, the environmental state and local agencies, and local communities associations, were invited to comment on the project, in accordance with the requirements of Resolution 1 of the Brazilian DNA. However, according to Resolution 1, the project participants did not invite all the stakeholders. In addition, the project proponent did not identify all stakeholders that have made comments. The letters sent to the local stakeholders, the comments received and how due account was taken were not evidenced. DNV requests a copy of these.</p> <p>Minutes of meeting of stakeholder consultation also needs to be provided.</p>	<del>CL</del> 7	OK
- Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	See E.1.1		OK
- If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR	See E.1.1		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
- Is a summary of the stakeholder comments received provided?	/1/	DR	See E.1.1		OK
- Has due account been taken of any stakeholder comments received?	/1/	DR	See E.1.1		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<b>A.6. Letter of approval</b>					
A.1.1 Is the LoA received directly from the DNA or through the project participant.	/1/	DR	Prior to the submission of the final validation report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil and DNA of Portugal, including the confirmation by the DNA of Brazil that the project assists it in achieving sustainable development.	--	--
<b>A.7. Project design</b>					
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 10 July 2008 the date of signing the Construction contract by Brascarbon and GPA Engenharia e Construções Ltda. for Fazenda Santo Antônio, Granja Sol Nascente, Fazenda		OK

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 CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			Paraíso, Fazenda Bela Vista /4/ Please see Table 2 C.1.1		
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/		The project is a small scale project. Although the project participant has another small scale project with the same methodology, all farms included in the other projects are located at distances greater than 1 km, hence the project is not a de-bundled component of a larger project activity. On 07 November 2008, DNV performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. The project participants of Ecoprogresso and Brascarbon were interviewed during the site visit at the swine farm where the biodigester and monitoring and flaring system was implemented.		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
<b>A.8. Project emissions not addressed by the methodology</b>					
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
<b>A.9. Documentation of baseline emissions</b>					

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CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<p>A.4.1 Documentation of the baseline determination:</p> <ul style="list-style-type: none"> <li>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.</li> <li>b. All documentation is relevant as well as correctly quoted and interpreted.</li> <li>c. Assumptions and data can be deemed reasonable</li> <li>d. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD.</li> <li>e. The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity</li> </ul>	/1/		<p>Yes.</p> <p>Please see Table 2- B.1.1, B.2.1, B.2.2 and B.5.</p>		OK
<b>A.10. Documentation of the calculations</b>					
<p>A.5.1 Algorithms and/or formulae used to determine emission reductions</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• All documentation is correctly quoted and interpreted.</li> <li>• All values used can be deemed reasonable in the context of the project activity</li> <li>• The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.</li> </ul>	/1/		Yes, Please See Table 2 B.4 and B.5.		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview  
 CDM Validation Protocol – Report No. 2008-1452, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<b>A.11. Implementation of the monitoring plan</b>					
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 be monitored ex-post and verified later by a DOE?	/1/		Yes, please see Table 2 B.8, B.9 and B.10.		OK
<b>A.12. CDM consideration prior to starting date</b>					
A.7.1 The prior consideration of CDM for the project activity complies with EB41 annex 46	/1/		Yes, Please see Table 2 B.3.4.		OK

\* MoV = Means of Verification, DR= Document Review, I= Interview  
 CDM Validation Protocol – Report No. 2008-1452, rev. 01

**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
<p><b>CAR 1</b></p> <p>As per AMS-III.D version 14, the Bo &amp; VS values applicable to developed country can be used subject to satisfying four conditions related to genetic source of production, use of formulated feed rations and project specific animal weight. Farm records to demonstrate that these conditions are satisfied at the project sites need to be provided, including the genetic source.</p> <p>Also justification to be provided for MCF value of 79 % and MS % BLj, value of 100% &amp; MS% i,y values of 90%y used in ex-post emission reduction calculation.</p>	B.5.1	<p>Bo &amp; VS values are adequate to the Brazilian Swine Production due the genetic adopted in the country from western Europe. One of the genetic supplier is Agrocere PIC (<a href="http://www.agrocerpic.com.br">www.agrocerpic.com.br</a>), originated in Great Britain.</p> <p>The genetic will be monitored annually according to the new procedure implemented POP 15- Genetic Monitoring. The PDD was revised and documents provided to DNV with this report.</p> <p>Genetic data from project sites will be sent with this report.</p> <p>The animal weight is controlled according to animal conversion feed rate and checked and monitored with the operational procedure POP 16. Information given from swine producers.</p> <p>Nutrition for feed rations are very developed as so as in developing countries to attend the conversion rate in animal feed operations. The POP 18, informed in the PDD Annex 4, will be renamed and changed to POP 14, where formulated feed rations documents are provided from farms.</p>	<p>The PDD version 2 dated 25 June 2009 was correctly revised. Evidences were provided showing that boar and finishers swine were supplied by Agrocere, DanBreg and Topigs to several swine farms. Together with the information provided on the food formulations, it was confirmed that selecting the factors from Western European genetics according to the IPCC 2006 is correct.</p> <p>Therefore this CAR is closed.</p>

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
		<p>The value of MCF of 79% is correct, where the medium temperature in the region where the PDD is located is justified by the table 6.2 in the PDD. The weather site informed in the table is official in Brazil. Also the information can be assessed by the following site:  <a href="http://satelite.cptec.inpe.br/PCD/">http://satelite.cptec.inpe.br/PCD/</a></p> <p>The MS%BLj is 100%, where 100% of the manure will be handled in the baseline, as indicated in the PDD section 6.2.</p> <p>The value of MS% i,y was changed to 100% in the PDD section 6.2, where 100% the manure will also handled in the project.</p>	
<p>CAR 2</p> <p>As per the monitoring requirements of AMS.III.D, version 14 and the methodological tool to determine project emissions from faring of gases containing methane, the following need to be included in the Monitoring Plan:</p> <p>(i) Manufactures specification for operation of the flare and the data and procedures to monitor is to be documented in PDD,( Refer serial No 26 of methodology and the methodological Tool to determine project</p>	B.8.1	<p>(i)Sent evidence to DNV Brazil with this report.</p> <p>(ii) description included in the PDD in the section B.7</p> <p>(iii)The genetic is monitored annually according to the operational procedure adopted and included in the PDD Annex 4 – POP 15.</p>	<p>The revised PDD version 2 dated 25 June 2009 and the CERs calculation spreadsheet PDD 3 - CER AMS III D - V14 rev 4 applies adequate factors according IPCC 2006 and AMS-III.D version 14.</p> <p>Therefore this CAR is closed.</p>



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
<p>emissions from flaring.)</p> <p>(ii)The system used for monitoring MS% i,y,”, and,Wsite &amp; NLT,y are to be described in PDD (as serial no.30 of AMS.IIID Version 14.).</p> <p>(iii) The genetic source of the livestock needs to be monitored. (as serial no 31(a) of Methodology).</p> <p>(iv) Onsite inspection of each farm for each verification period needs to be included. .(as serial no 33 of Methodology).</p> <p>(v) Determination of hourly mass flow rate of methane in the residual gas (TMRG,h) for arriving flare efficiency (refer Step 5 &amp; 6 of Tool) and monitoring of FVRG,h is not specifically included in the parameters to be monitored</p> <p>In addition the PDD shall document the type of Flare (Open/closed) and the approach to determine flare efficiency. Since the PP is using default value for methane destruction efficiency, PDD shall document that manufacturer’s specifications for the operation of the flare and the required data and procedures to monitor these specifications. Further, PDD needs to state that if any of the flare parameters are out of range, only 50% of default value shall be used</p>		<p>(iv) The PDD shows the inspection activity for each site according to the operational procedure detailed POP 2 in the Annex 4. The comments in the table will be changed to on site inspection instead of licenses.</p> <p>(v) The monitoring system adopted to determinate the residual gas is implemented in the operational procedure POP 5 which determines also the concentration of methane in the residual gas fv CH<sub>4</sub>,RG,h. Included in the tables of the section B.7.1 the monitoring procedure of the residual gas, also in the section B.7.2 and Annex 4. The FV RG,h is monitored according to the operational procedure POP -04 where the volume is monitored.</p> <p>The determination of the TMRG,h is included in the operational procedure POP 17 which also determines the calculation of the project emissions ex-post</p> <p>Also included in the PDD the general description of the flare in the section A.4.</p> <p>Manufactures specification will be sent to DNV Brazil with this report. The parameters of the flare specification to</p>	

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
<p>for that hour.</p> <p>The monitoring of MS%iy, ndy, Genetic source of the livestock and other Flare operating parameters needs to be included in the monitoring plan, as per requirement of methodology.</p> <p>Monitoring of Nda,y and Np,y also needs to be included in the monitoring plan and procedure for NLT,y determination clearly stated in the PDD.</p> <p>The procedure for Wsite given in the monitoring plan is Archieve electronically + files, during project plus 5 years. Procedure for the same shall be clearly identified in the PDD.</p>		<p>determine the flare efficiency will be controlled by a operational procedure POP 8 where the hourly temperature is controlled e according to the specification of the flare in the range of 0% to 90%. Details will be included in the PDD section B.7.2.</p> <p>MS% I,y included in the monitoring system POP 2 – site inspection. Included in the table B9 section B.7.2.</p> <p>All parameters to control to determine the NLT,y is included in the PDD section B.7. The Nday,y and the Np,y are controlled with the operational procedure POP 3 where monthly data is collected in each farm.</p> <p>In the table B.9 in the section B.7.2 is clearly defined the archive plan for all monitoring data.</p>	
<p>CL 1</p> <p>The project proponent is requested to provide documentary evidence of the starting date of the project as the earliest of implementation, construction and real action in line with the guidelines of EB 41.</p>	<p>B.3.4</p> <p>C.1.1</p>	<p>Brascarbon considers the date of 01/10/2008 as starting date of the project activity, when the first construction started for a pig farm. This is in line with EB41 guidelines.</p> <p>Farms were not completed now with the</p>	<p>The LoI signed by the PP could evidenced the CDM consideration for the project. In addition, complementary information was provided as evidence for the starting date and the intention to implement methane avoidance projects</p>

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
		<p>CDM projects, they are still on construction.</p> <p>The CDM decision was taken before the starting date of the project according to the evidence provided to the validator.</p>	<p>from swine manure management systems.</p> <p>As the validation process started on 28 August 2008 continuing and real actions were taken to secure CDM status for the project.</p>
<p>CL 1 CONTINUING</p> <p>However, according EB 41 guideline, since the start date is before 3 August 2008, evidence to prove that CDM benefits were a decisive factor in the decision to proceed with the Project is needed. Also, chronology of even to prove that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation is to be provided with evidences.</p>		<p>The evidence to prove the starting date will be sent to DNV Brazil.</p> <p>The document -Relatorio de Impacto Ambiental – sent to DNV Brazil with this report.</p> <p>Time schedule of the project sent to DNV Brazil to prove the continuing the real actions of the CDM status.</p>	<p>Therefore this CL is closed.</p>
<p>CL 2</p> <p>The project doesn't clarify if the electricity will be generated and if it will be requested for CERs.</p>	A.3.1	<p>Included in the section A.4 the clarification of the no requests for the CER's generated of the energy produced by the use of the biogas. Also described clearly the system implemented to generate power to the project.</p>	<p>The revised PDD version 2 dated 25 June 2009 clearly states that possible electricity generated by the farms with the biogas will be not considered to request any CERs of renewable energy. Therefore this CL is closed.</p>
<p>CL 3</p> <p>According EB 41, a sensitive analysis has to be carried out for the NPV analysis.</p>		<p>Included the sensitive analysis into account in the information already presented in the PDD section B.5.</p>	<p>The revised PDD version 2 dated 16 March 2009 includes the sensitive investment analysis for each farm. The analysis shows that the project activity</p>

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
			is always the least attractive scenario. Hence, it is sufficiently demonstrated that the project faces an investment barrier. Therefore this CL is closed.
<p>CL 4</p> <p>As the PDD declare “The treated water is then recycled and sent back to the farms, or used for irrigation by the use of biogas or electrical stationary pumps. DNV request to explain in PDD why project emission on account of use of electricity for operation of the facility is not considered in the farms.</p>	B.4.1	<p>The declaration in the item A.4 will be revised and clearly explained. The energy to the stationary pumps will be powered by a biogas co-generator.</p> <p>In normal situation the treated water is sent to the pasture by gravity. In the second best choice is the water biogas pumps and the third option in the use of electrical pump powered by a biogas generator.</p> <p>All this operations will be out of the project boundary.</p>	<p>The reviewed PDD version 2 dated of 25 June 2009 had included the monitoring of possible electricity consumption on each farm.</p> <p>Therefore this CL is closed.</p>
<p>CL 5</p> <p>The following need to be included in the Monitoring Plan.</p> <p>(i) Manufactures specification for operation of the flare and the data and procedures to monitor is to be documented in PDD, as required under the methodological “Tool to determine project emissions from flaring”.</p>	B.9.1	<p>(i) It will be explained in the section B.7.2. The flare monitoring is included in the operational procedure POP 8 – flare efficiency.</p> <p>(ii) (ii)MS% I,y , Wsite and NLT,y included in the PDD section B.7.2.</p>	<p>The reviewed PDD version 2 dated 25 June 2009 and complementary operation procedures submitted to DNV demonstrate the correct Monitoring Plan according AMS-III.D version 14.</p> <p>Therefore this CL is closed.</p>

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
<p>Also see serial No 26 of methodology.</p> <p>(ii) The system used for monitoring MS% i,y,” and, Wsite &amp; NLT,y are to be described in PDD( see serial no.30 of AMS.III.D,Version 14.).</p> <p>(iii) The genetic source of the livestock need to be monitored.(see serial no 31(a) of Methodology).</p> <p>(iv) Onsite inspection of each farm for each verification period need to be included. .(see serial no 33 of Methodology).</p> <p>(v) Determination of hourly mass flow rate of methane in the residual gas (TMRG,h) for arriving flare efficiency (refer Step 5 &amp; 6 of Tool) and monitoring of FVRG,h is not specifically included in the parameters to be monitored</p>		<p>(iii) A operational procedure POP 15 is implemented to monitor the genetic annually</p> <p>(iv) The farm inspection is at least once a year, according to the POP 2 Site Inspection. Section B7.1 in the PDD.</p> <p>(v) The mass flow rate is determined in the operational procedure POP 17. The FVRG,h will be included in the POP 5, where the fraction of methane in the biogas and in the residual gas is monitored.</p>	
<p>CL 6</p> <p>As stated in the PDD, the project will reduce the environment impacts, like the population of lies, possible spread of disease and odor; however no comment was included about environment licenses of the farms. DNV requests documented evidences of the Environmental Licenses</p>	D.1.1	<p>The document Environmental Impact Report -Relatorio de Impacto Ambiental – to be send to DNV Brazil with this report. In addition, the following environmental licenses were provided:</p> <p>Farm / site – License</p> <p>Faz. Bela Vista – Almir – 00333 / 24 January 2007  Fazenda Estiva – 012577 / 15 August 2008  Fazenda Campo Alegre – LO053 / 15 June 2007  Faz. Bela Vista- Saraiva – LO061 / 13 July 2007  Faz. Barreiro – Miguel – LO115 / 3 November 2004  Fazenda Santa Juliana – LO113 / 3 November 2004</p>	<p>The document Environmental Impact Report and environmental licenses were presented.</p> <p>There for this CL is closed.</p>

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
		Faz. Santo Antonio – LO040 / 31 March 2006 Faz. Barreiro- Belchior – LO044 / 3 November 2003 Fazenda Caixeta – LO021 / 9 March 2007 Fazenda Lageado – 5453 / 21 August 2008 Faz. Paraíso – LO047 / 21 May 2004 Faz. Da Lagoa – 617087 / 27 November 2007 Granja Sol Nascente – LO042 / 3 September 2001 Faz. Dona Alice – 5606629410152 / 30 November 2007 Faz. Capão Grosso – 560662288011 / 28 November 2007 Granja Dona Alzira – 5606725450127 / 02 January 2008	
<b>CL 7</b> Local stakeholders, such as the City Hall, the environmental state and local agencies, and local communities associations, were invited to comment on the project, in accordance with the requirements of Resolution 1 of the Brazilian DNA. However, according to Resolution 1, the project participants did not invite all the stakeholders. In addition, the project proponent did not identify all stakeholders that have made comments. The letters sent to the local stakeholders, the comments received and how due account was taken were not evidenced. DNV requests a copy of these.	E.1.1	The copy of letters sent to the local stakeholders, the comments received and how due account was taken will be showed to DNV.	The invitations letters and the mail receipts were received from the PP. In addition all clarification meetings and commentaries were verified. All comments were about the specific technician issues and supporting the project. Therefore this CL is closed.

## **APPENDIX B**

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### **CERTIFICATES OF COMPETENCE**



# CERTIFICATE OF COMPETENCE

***Luis Filipe Tavares***

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

<b>GHG Auditor:</b>	Yes				
<b>Technical Area</b>	<b>CDM Validator</b>	<b>CDM Verifier</b>	<b>Sector Expert</b>	<b>Methodology Expert</b>	<b>Technical Reviewer</b>
Landfill gas	Jan 2009	Jan 2009			
Hydro power	Jan 2009	Jan 2009			
Renewables					
Wind power					
Other renewable					
Biomass					
Grid connection of isolated system					
Cement					
Waste-heat / waste-gas recovery	Jan 2009				
Efficiency of thermal power plants					
Coal mine methane					
Fuel switch					
Manure management	Jan 2009	Jan 2009	Jan 2009		
Waste / wastewater treatment	Jan 2009	Jan 2009	Jan 2009		
Energy efficiency					
N <sub>2</sub> O					
HFCs					
Flare reduction					
PFCs					
Charcoal					
CO <sub>2</sub> recovery					
Transport					
Non-renewable biomass					
Biofuel					
Pipeline leakage reduction					
SF <sub>6</sub>					

Høvik, 9 January 2009

*Michael Lehmann*

Michael Lehmann

Technical Director, Climate Change Services





# CERTIFICATE OF COMPETENCE

**Andrea Leiroz**

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

<b>GHG Auditor:</b>	Yes				
<b>Technical Area</b>	<b>CDM Validator</b>	<b>CDM Verifier</b>	<b>Sector Expert</b>	<b>Methodology Expert</b>	<b>Technical Reviewer</b>
Landfill gas					
Hydro power	Jan 2009	Jan 2009			
Renewables					
Wind power					
Other renewable					
Biomass	Jan 2009	Jan 2009			
Grid connection of isolated system					
Cement					
Waste-heat / waste-gas recovery					
Efficiency of thermal power plants					
Coal mine methane					
Fuel switch					
Manure management	Jan 2009	Jan 2009			
Waste / wastewater treatment					
Energy efficiency					
N <sub>2</sub> O					
HFCs					
Flare reduction					
PFCs					
Charcoal					
CO <sub>2</sub> recovery					
Transport					
Non-renewable biomass					
Biofuel					
Pipeline leakage reduction					
SF <sub>6</sub>					

Høvik, 9 January 2009

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## CERTIFICATE OF COMPETENCE

***Fabiana Philipi***

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

<b>GHG Auditor:</b>	Yes				
<b>Technical Area</b>	<b>CDM Validator</b>	<b>CDM Verifier</b>	<b>Sector Expert</b>	<b>Methodology Expert</b>	<b>Technical Reviewer</b>
Landfill gas					
Hydro power					
Renewables Wind power					
Other renewable					
Biomass					
Grid connection of isolated system					
Cement					
Waste-heat / waste-gas recovery					
Efficiency of thermal power plants					
Coal mine methane					
Fuel switch					
Manure management					
Waste / wastewater treatment					
Energy efficiency					
N <sub>2</sub> O					
HFCs					
Flare reduction					
PFCs					
Charcoal					
CO <sub>2</sub> recovery					
Transport					
Non-renewable biomass					
Biofuel					
Pipeline leakage reduction					
SF <sub>6</sub>					

Høvik, 20 May 2009

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Michael Lehmann

Technical Director, Climate Change Services



# CERTIFICATE OF COMPETENCE

***Kumaraswamy Chandrashekara***

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

<b>GHG Auditor:</b>	yes				
<b>Technical Area</b>	<b>CDM Validator</b>	<b>CDM Verifier</b>	<b>Sector Expert</b>	<b>Methodology Expert</b>	<b>Technical Reviewer</b>
Landfill gas	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Hydro power	Jan 2009	Jan 2009			
Renewables	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Wind power	Jan 2009	Jan 2009			
Other renewable	Jan 2009	Jan 2009			
Biomass	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Grid connection of isolated system	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Cement	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Waste-heat / waste-gas recovery	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
Efficiency of thermal power plants	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Coal mine methane	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Fuel switch	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Manure management	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Waste / wastewater treatment	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Energy efficiency	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
N <sub>2</sub> O	Jan 2009	Jan 2009		Jan 2009	Jan 2009
HFCs	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
Flare reduction	Jan 2009	Jan 2009		Jan 2009	Jan 2009
PFCs	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Charcoal	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
CO <sub>2</sub> recovery	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
Transport	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Non-renewable biomass	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Biofuel	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Pipeline leakage reduction	Jan 2009	Jan 2009		Jan 2009	Jan 2009
SF <sub>6</sub>	Jan 2009	Jan 2009		Jan 2009	Jan 2009

Høvik, 9 January 2009

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Michael Lehmann

Technical Director, Climate Change Services



# CERTIFICATE OF COMPETENCE

***Michael Lehmann***

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

<b>GHG Auditor:</b>	Yes				
<b>Technical Area</b>	<b>CDM Validator</b>	<b>CDM Verifier</b>	<b>Sector Expert</b>	<b>Methodology Expert</b>	<b>Technical Reviewer</b>
<i>Landfill gas</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Hydro power</i>	Jan 2009	Jan 2009	Jan 2009		
<i>Renewables Wind power</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Other renewable</i>	Jan 2009	Jan 2009			
<i>Biomass</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Grid connection of isolated system</i>	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
<i>Cement</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Waste-heat / waste-gas recovery</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Efficiency of thermal power plants</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Coal mine methane</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Fuel switch</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Manure management</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Waste / wastewater treatment</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Energy efficiency</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>N<sub>2</sub>O</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>HFCs</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Flare reduction</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>PFCs</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Charcoal</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>CO<sub>2</sub> recovery</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Transport</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Non-renewable biomass</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Biofuel</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>Pipeline leakage reduction</i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009
<i>SF<sub>6</sub></i>	Jan 2009	Jan 2009		Jan 2009	Jan 2009

Høvik, 9 January 2009

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