



VALIDATION REPORT

“Agroceres – Methane capture and combustion at Granja Paraiso” in Brazil

REPORT No. 2009-0834

REVISION No. 01



VALIDATION REPORT

Date of first issue: 26 June 2009	Project No.: PRJC-146198-2009-CCS-BRA
Approved by: Ole Andreas Flagstad	Organisational unit: Climate Change Services
Client: Agroceres Genética e Nutrição Animal Ltda	Client ref.: Vitor Vanetti de Araujo

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Project Name: "Agroceres – Methane capture and combustion at Granja Paraiso"
Country: Brazil
Methodology: AMS-III.D **Version:** 14
GHG reducing Measure/Technology: "Methane recovery in animal manure management systems"

ER estimate: 121,210 tCO₂e over 7 years (17,316 tCO₂e 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

In summary, it is DNV's opinion that the "Agroceres – Methane capture and combustion at Granja Paraiso" in Brazil, as described in the PDD of 24 September 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 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, including the confirmation that the project assists it in achieving sustainable development.

Report No.: 2009-0834	Date of this revision: 6 November 2009	Rev. No. 01
Report title: "Agroceres – Methane capture and combustion at Granja Paraiso" in Brazil		
Work carried out by: Felipe Lacerda Antunes		
Work verified by: Chandrashekara Kumaraswamy		

Key words:

Climate Change

Kyoto Protocol

Validation

Clean Development Mechanism

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Abbreviations

B ₀	m ³ CH ₄ /kg VS (capacity of volatile solid transformed to methane)
BRL	Brazil Reais
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH ₄	Methane
CL	Clarification request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
FFR	Formulated Feed Ration
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
HP	Horse Power
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 swine head



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1 EXECUTIVE SUMMARY – VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the “Agroceres – Methane capture and combustion at Granja Paraíso”, located in 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 participant is Agroceres Genética e Nutrição Animal Ltda of Brazil. The host Party Brazil meets all relevant participation requirements. No participating Annex I Party is yet identified.

The objective of the project is to capture and burn the biogas generated by the decomposition of the swine manure produced at the Granja Paraíso farm. 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.

By capturing and destroying biogas from swine manure, the project results in reductions of CO₂ 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. The total emission reductions from the project are estimated to be on the average 17,316 tCO₂e per year over the selected 7 year renewable crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The monitoring methodology has been correctly applied. The monitoring plan sufficiently specifies the monitoring requirements of the main project indicators. Adequate training and monitoring procedures have been implemented.

Local stakeholders, such as the municipal government, the state and municipal environmental agencies, the Brazilian forum of NGOs, neighbouring communities and the office of the attorney general, were invited to comment on the project, in accordance with the requirements of Resolution 1 of the Brazilian DNA

In summary, it is DNV’s opinion that the “Agroceres – Methane capture and combustion at Granja Paraíso” as described in the project design document of 24 September 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 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



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receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation that the project assists it in achieving sustainable development.



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2 INTRODUCTION

Agroceres Genética e Nutrição Animal Ltda has commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the “Agroceres – Methane capture and combustion at Granja Paraíso” CDM project, located in 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. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, the simplified modalities and procedures for small-scale CDM project activities, and the subsequent decisions by the CDM Executive Board.

2.1 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 monitoring methodology AMS-III.D (Version 14) /4/. The validation team has, based on the recommendations in the Validation and Verification Manual /3/ employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

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.

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3 METHODOLOGY

The validation consisted of the following three phases:

- I a desk review of the project design documents
- II follow-up interviews with project stakeholders
- III the resolution of outstanding issues and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Desk Review of the Project Design Documentation

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

- /1/ Project Design Document for the “Agroceres – Methane capture and combustion at Granja Paraiso”. Version 01 of 27 April 2009 and revised Version 02 of 24 September 2009.
- /2/ Emission reduction calculation: spreadsheet Agroceres_calculo_validacao_v1.xls
- /3/ CDM Executive Board: Validation and Verification Manual. Version 01
- /4/ CDM Executive Board: Appendix B of the “Simplified modalities and procedures for small-scale CDM project activities”: Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activities. AMS-III.D – “*Methane recovery in animal manure management systems*” Version 14.
- /5/ CDM Executive Board: “Tool to determine project emissions from flaring gases containing methane” (version 1).
- /6/ CDM Executive Board: “Tool to calculate the emission factor for an electricity system” (Version 01.1)
- /7/ Brazilian grid emission factor <http://www.mct.gov.br/index.php/content/view/74689.html>
- /8/ 2006 IPCC Guidelines for National Greenhouse Gas Inventories –Volume 4 Chapter 10
- /9/ Brazilian Water Environment Legislation
<http://www.mma.gov.br/port/conama/res/res05/res35705.pdf>
- /10/ Agroceres: contract with Falk for the lagoons installation dated 10 July 2000
Agroceres: contract with Falk for the lagoons installation dated 16 October 2000
Baltazar Reis de Mendonça: contract for plateau and cells installation dated 1 September 2008
Agroceres: contract with Sansuy for the biodigester purchase and installation dated 29 September 2008
Vieira Borges Engenharia: contract for civil construction dated 6 October 2008
Top Construtora: contract for the vinibiodigestors execution dated 10 October 2008
Agroceres: contract with TEC for the skid and flare purchase and installation dated 10 July 2009



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- Agroceres: purchase order for Landtec for the GEM 2000 analyser dated 14 July 2009
- /11/ Top Construtora: letter confirming that the civil works have a lifetime of 10 years dated 8 April 2009
- /12/ Evidences of previous CDM consideration and real actions to secure CDM status:
- Agroceres: Board Meeting Minutes dated 11 July 2008 in which the project is approved to be implemented as a CDM project
 - Agroceres: letter to Brazilian DNA presenting the project and informing the intention to seek CDM status dated 26 January 2009 and confirmed in 27 January 2009
 - PricewaterhouseCoopers: proposal to support Agroceres on the CDM process dated 21 November 2008.
- /13/ Environmental Secretary of Minas Gerais state: operational license 114 valid until 29 November 2008, and renewal process of operation license confirmation dated 12 February 2009
- /14/ Stakeholders consultation process evidence: invitation letters dated 15 December 2008 and two comments congratulating the project
- /15/ Brazilian Agriculture Ministry: Agroceres authorization for importing swine genetic material from Canada dated 11 February 2008
- /16/ Agroceres: operational spreadsheets with FFR and swine weight control
- /17/ Lima, M.A., Pessoa, M.C.P.Y., Ligo, M.A.V., **Inventário Brasileiro de Emissões Antrópicas de Gases de Efeito Estufa, Emissões de metano na pecuária (“Brazilian Inventory of GHG, Methane emissions in livestock”)**, Technology and Science Minister, 2006
- /18/ Agroceres: Environmental Evaluation Report dated October 2008
- /19/ IGP-M defined by Brazilian Central Bank
(<http://www4.bcb.gov.br/Pec/Correcao/corrig.asp?idpai=correcao>)
- /20/ INMET: Patos de Minas Average temperature data for 2007 and 2008

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

- Adjustments and corrections as per the responses to the CAR’s/CL’s described in Table 3 of the validation protocol.

3.2 Follow-up Interviews with Project Stakeholders

DNV performed a site visit (Felipe Antunes) at Granja Paraíso farm and Agroceres’ office in 18 and 19 June 2009 with project stakeholders to confirm selected information and to resolve issues identified in the document review.

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

Date	Name	Organization	Topic
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/21/	18 Jun 2009	Haroldo Caixeta – Production Supervisor	Agroceres	<ul style="list-style-type: none"> • Additionality of the project • Monitoring plan • Baseline emission estimation • Project emission estimation • Historic average swine population • Environmental licenses/legal compliance • Stakeholders consultation process
/22/	18 Jun 2009	Francisco Silva – Project Engineer	Agroceres	
/23/	18 Jun 2009	Carlo Pereira – Consultant	PwC	
/24/	18 Jun 2009	Eloísa Casadei – Consultant	PwC	
/25/	18 Jun 2009	Henrique Nunes – Consultant	Independent Consultant	



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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 to 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 “Agroceres – Methane capture and combustion at Granja Paraiso” 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.

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Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities				
Requirement	Reference	Conclusion		
<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 (OK), a Corrective Action Request (CAR) of risk or non-compliance with stated requirements or a request for Clarification (CL) where further clarifications are needed.</i>		

Validation Protocol Table 2: Requirement checklist				
Checklist Question	Reference	Means of verification (MoV)	Comment	Draft and/or Final Conclusion
<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 (OK), or a corrective action request (CAR) 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>

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Draft report clarifications and corrective action requests	Ref. to checklist question in table 2	Summary of project owner response	Validation conclusion
<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



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3.4 Internal Quality Control

The validation report including the validation findings underwent a technical review before being submitted to the project participants. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation Team

<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	Antunes	Felipe	Brazil	x	x	x			
Technical reviewer	Chandrashekara	Kumaraswamy	India					x	

The qualification of each individual validation team member is detailed in Appendix B to this 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 validation findings relate to the project design as documented and described in the submitted project design documentation of 24 September 2009 /1/.

4.1 Participation Requirements

The Project participant is Agrocere Genética e Nutrição Animal Ltda of Brazil. The host Party Brazil meets all relevant participation requirements. No participating Annex I Party is yet identified.

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, including the confirmation that the project assists it in achieving sustainable development.

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.

4.2 Project Design

The project activity envisages the implementation of anaerobic biodigesters in Granja Paraíso farm located in Minas Gerais State, Brazil to treat the swine wastes in controlled anaerobic conditions, capture and flare the biogas generated.

Granja Paraíso is divided into three modules, which are Sítio, NEST 1 and NEST 2. Each module is completely independent of each other and it has its own management system, composed by four anaerobic lagoons (anaerobic, facultative and polishing). In such scenario will be installed the biodigestors, two in parallel in each core. The animal waste will be launched directly into the biodigestors, where, later, will be released to the lagoons. The sludge generated in the digesters will be used in the farm in aerobic conditions. In the baseline scenario, the swine wastes was being treated in open anaerobic lagoons and the methane generated was being vented to the atmosphere, as is the common practice in the swine farms of Brazil. The project will not involve any electricity generation to be used/sold from the biogas.

The project is expected to bring environmental benefits (reduction of GHG emissions, reduced risk of ground and water bodies contamination, etc), thus contributing to sustainable development objectives of the Brazilian Government. However, the DNA of Brazil has not yet confirmed the project's contribution to sustainable development.

The starting date of the project activity is stated to be 1 September 2008, corresponding to the date of the contract signing for the biodigester plateau and cell installations /10/. DNV could confirm that this corresponded to the project proponent's first commitment on expenditures, as this is the oldest contract related to the project /10/. The project assumes a renewable crediting period of 7 years starting on 1 December 2009 or the date of registration of the project. The expected operational lifetime of some materials (like the biodigester cover and the structure) is 10 years, as stated in the letter from the company that will do the civil works /11/. However, those materials could be reformed in order to have a 21-year lifetime.



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The project participant does not have any other small scale project with the same methodology located at distances smaller than 1 km, hence the project is not a de-bundled component of a larger project activity.

The project description is to the consideration of DNV complete and accurate.

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” /4/. The methodology “AMS-I.D. Grid connected renewable electricity generation” (Version 13) is also applicable primarily for determining the emission factor of Brazilian grid. The project meets the applicability criteria of AMS-III.D (Version 14) as it is demonstrated that:

- The project activity recovers methane generated in the treatment of swine manure by installing methane recovery and combustion systems. The environmental legislation of Brazil permits no discharge of swine manure effluent into water bodies /9/. The usual practice is to use the anaerobic open lagoons with methane emissions escaping to the atmosphere /17/;
- The livestock population at Granja Paraíso farm is managed under confined conditions. This was verified during the site visit;
- Manure or effluents generated after treatment in the anaerobic bio-digesters is not discharged into natural water resources. This was verified through reviewing the environment license /13/ and the environmental legislation /9/;
- The annual average temperature of the baseline site is 22°C and hence higher than the methodology stipulated temperature of 5°C. This was verified through information available from INMET, the Brazilian national meteorological institute /20/;
- The retention time of waste in the anaerobic open lagoons has been demonstrated to be more than 1 month – 116 days for Sitio 1 and 169 days for Nest 1 and Nest 2, as verified through the environmental evaluation report /18/. The depth of the open lagoons is greater than 1 meter – 3.0 m for the first lagoon, 3.5 m for the second, 1.5 m for the third and 1.0 m for the fourth, as verified through the environmental evaluation report /18/ and during the site visit;
- No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario as verified during the site visit;
- The project involves the use of effluent and stabilized sludge for crops irrigation at the farm, without any anaerobic conditions, as verified during the site visit;
- The project activity involves facilities to flare the recovered biogas or eventually use it to produce electricity for on-site use without claiming CERs from displacing grid electricity;
- The annual estimated emissions reductions of 17,316 tCO₂e are lower than the limit of 60 kt CO₂ equivalent /2/.

Thus, AMS-III.D is applicable to the project in accordance with the existing criteria.

In the absence of the CDM project activity, the existing facility would continue to emit methane to the atmosphere at historical average levels, considering that in the Brazilian swine production sector, only restrictions to discharge the manure into the ground water are included

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in environmental legislation /9/, and the common practice is use of anaerobic open lagoon /17/ considering that the cost of biodigester is very high to swine farmer. The swine farmers therefore prefer to invest in the development of swine production, and not in capture and destroying the biodigester gas. Only projects applying CDM have implemented biodigesters in the swine farm business in Brazil.

Hence, the baseline is the emission of methane from anaerobic decay of swine manure in existing open lagoons, calculated in accordance with the methodology and using default values from 2006 IPCC Guidelines for National Greenhouse Gas Inventories. DNV has verified during the site visit that the swine population is of British and Canadian origin /15/.

The IPCC default values for the parameters B_0 and VS for European genetic has been chosen for the entire swine population and management used by Agrocere, and specifically the VS, adjusted to the weight of Agrocere livestock and respective MCF for anaerobic open lagoons and ambient temperature for Patos de Minas (MG).

The project boundary is defined as the methane recovery and destroying/combustion facility, in accordance with AMS-III.D (Version 14). The selected sources and gases are justified for the project activity.

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 to demonstrate the additionality of the project through an analysis of the following barriers: (a) investment barriers and (b) other barriers for the two scenarios: i) continuation of current activities (anaerobic decay of swine manure in existing open lagoons) and ii) treat the swine manure in biodigesters, capture and flare the gas.

While the continuation of current activities does not face any barriers, the project implementation faces barriers described in the following sections.

4.4.1 CDM consideration and continued action to secure CDM status

The serious consideration of CDM prior to project start was demonstrated through the Board Meeting Minutes dated 11 July 2008 in which the project is approved to be implemented as a CDM project /12/.

The starting date of the project activity is 1 September 2008 which is the date of signing the contract for the plateau and cells installation /10/.

Besides that, as required by EB41 annex 46, the project proponent sent a letter to the Brazilian DNA within six months after the project starting date (sent on 26 January 2009) presenting the project and informing the intention to seek CDM status /12/.

Real action to secure CDM registration were undertaken in parallel as confirmed with ProcewaterhouseCoopers proposal to support Agrocere on CDM projects dated 21 November 2008 /12/ and the subsequent PDD development. The validation process started on 6 May 2009.



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4.4.2 Investment barriers

Since there are currently no direct subsidies or promotional support for the implementation of manure management or capture and destroying biogas and there are higher costs required to install biodigesters and flare than what would be represented by the baseline scenario, the project faces investment barriers compared with the usual practice of open anaerobic lagoons. There are no electricity generation components considered for this project, as confirmed during the site visit, and hence the project generates no financial or economic benefits. An investment analysis was performed to demonstrate that the project is not financially attractive and thus faces investment barriers.

4.4.2.1 Investment analysis: Choice of approach

Since the proposed project will be implemented only to capture and flare the biogas with no revenues other than CDM related income, a simple cost analysis is selected.

4.4.2.2 Investment analysis: Input parameters

For the simple cost analysis, the input could consider the investment of the biodigester, which could be compared with the investment in the anaerobic lagoon. The evidence of the related costs was provided to DNV /10/.

4.4.2.3 Investment analysis: Calculation and conclusion

The project proponent invested BRS 175,000 in the construction of the anaerobic lagoons in 2000 /10/. This costs correspond to BRS 387,127.67 in September 2008, by correcting them according to IGP-M (Brazilian General Price Index) /19/. On the other hand, the real investment in the purchase and installation of the biodigesters was BRS 1,018,633.60 /10/. Consequently, this comparison shows that the the project activity installation costs are almost three times higher than the traditional anaerobic lagoons installation costs, so the project activity faces an investment barrier.

4.4.3 Other barriers:

The Brazilian environment legislation for the swine activities require proper treatment of manure and do not permit discharge of effluents into water bodies /9/. The common practice for treatment of effluent is the open lagoon (esterqueira) which avoids water pollution and also produces fertilizer, which can be used on the crops /17/. The use of a bio-digester is not common due the high investment and the specific skills (and costs linked to these) needed to build and operate them, because the anaerobic treatment to produce gas involve the chemical and bacterial control is not common to swine farmers, as 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 for the 7 years credit period 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” /4/, in accordance with Appendix B of the simplifies modalities for small-scale CDM project activities.



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The monitoring plan is in accordance with the monitoring methodology. The monitoring plan will give opportunity for real measurements of achieved emission reductions. According to AMS-III.D (Version 14), the monitoring consists of direct measurement of the amount of methane fueled or flared.

Concerning leakage, no sources of emissions were identified according to AMS-III.D (Version 14).

4.5.1 Parameters determined ex-ante

Baseline emission estimations are correct and transparently documented in the spreadsheet “Emission reduction calculation: spreadsheet Agrocerees_calculo_validacao_v1” /2/. The emission reductions are calculated considering the IPCC2006 Tier 2 /8/.

The variable B_0 for Western European swine is found reasonable by DNV, considering the English and Canadian genetic source used by Agrocerees /15/. The variable MCF consider the average ambient temperature for Patos de Minas (MG) /20/ and apply a conservativeness factor of 0.94. The variable V_s considers the default value for Market and Breeding Swine population and was adjusted according the weight per swine age. The historical swine population per farm was verified through Agrocerees operational spreadsheets verified during the site visit /16/.

DNV considers the established parameters correct and reasonable.

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 flow of biogas captured will be continuously monitored and corrected by temperature and pressure. The biogas will be measured monthly by “GEM2000” analyzer, which makes it possible to measure methane content directly. The frequency of sampling and measurement will be evaluated in order to assure 95% of confidence.

The default value of 90% will be applied for the flare efficiency according to the procedures outlined in the “*Tool to determine project emissions from flaring gases containing methane*” /5/. The temperature and flow rate of the flare will be monitored, in order to assure the default value of 90% efficiency. An electronic control system will assure that all gas will be burned. If any trouble happens the data-logger system will register it and this will not be accounted for the emission reductions.

The project emissions from electricity consumption are calculated considering the power capacity of the motor and compressor set to be used to exhaust continuously the biogas from the bio-digesters to flare (36.986 HP, or 27.58 kW). According to AMS-III.D, it will be considered that these equipments operate at full rated capacity during the whole year, plus 10% for distribution losses. The Brazilian DNA publishes yearly the EF according “*Tool to calculate the emission factor for an electricity system*” and this parameter will be updated ex-post.

The sludge disposition will be registered in operational book and electronic spreadsheet, to ensure the sludge is handled aerobically.

All data will be kept until two years after the end of the crediting period.



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The application of the monitoring methodology is transparent and DNV considers the project participants able to implement the monitoring plan. DNV also considers the monitoring approaches for the parameters described appropriate and effective.

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 Agrocere have enough resources and skills to assure adequate operation and monitoring of the bio-digesters and the biogas capture and flaring system.

4.6 Estimate of GHG Emissions

Emission reduction calculations are transparently documented by Agrocere spreadsheets /2/ and are in line with AMS-III.D (Version 14).

The project emissions were calculated considering the inefficiency of bio-digester, the flare efficiency of 90% as established by “Tool to determine project emissions from flaring gases containing methane” /5/. In addition it considered the emission from electricity consumed considering the Brazilian DNA emission factor /7/. Finally, project emissions considered also the physical leakage of biogas as required in AMS-III.D.

The baseline emission calculation considered the open anaerobic lagoon among the scenarios from IPCC 2006, as common practice as verified on correspondent literature /17/, and as permitted by the environmental regulation /9/.

The baseline emissions calculation consider the emissions of methane from anaerobic decay of swine manure, calculated in accordance with the most recent IPCC tier 2 approach (IPCC 2006 Guidelines) /8/ and applying IPCC default values for the parameters B0 and VS for European genetic and management used by Agrocere, and specifically the VS, adjusted to the weight of Agrocere livestock and respective MCF for anaerobic open lagoons and ambient temperature for Patos de Minas (MG). No leakage accounted is required.

Based on the above calculation, the emission reductions from the project have been determined to be 17,316 tCO₂ per year. The baseline emission estimate can be replicated using the data and parameter values provided in the PDD and supporting files submitted for registration. The data sources mentioned have been verified by DNV.

DNV assessed the calculations and in summary, the GHG calculations are found to be complete and transparent, and their accuracy has been verified. No other project emission or leakage sources contributing more than 1% and not mentioned by the methodology have been found.

4.7 Environmental Impacts

As stated in the PDD, the project will reduce the environmental impacts, like organic load of wastewater, odor and others. The farm operational license is under renewal process under the Environmental Secretary of Minas Gerais /13/.



VALIDATION REPORT

4.8 Comments by Local Stakeholders

Local stakeholders, such as the City Hall and Municipal Assembly, District Attorney, the environmental state and local agencies, the Brazilian forum of NGOs and local communities associations, were invited to comment on the project, in accordance with the requirements of Resolution 1 of the Brazilian DNA. The letters sent to the local stakeholders, the comments received and how due account was taken were evidenced by DNV /14/. No negative comments were received.

DNV considers the local stakeholder consultation carried out to be adequate.

4.9 Comments by Parties, Stakeholders and NGOs

The PDD of 27 April 2009 was made publicly available on DNV's climate change website (<http://cdm.unfccc.int/Projects/Validation/DB/OF555BRQX9ZBMKGH4CCY3USTGUQ0P2/view.html>) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 6 May 2009 to 4 June 2009. No comment was received.

APPENDIX A

CDM VALIDATION PROTOCOL

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

Requirement	Reference	Conclusion
About Parties		
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3.	Kyoto Protocol Art.12.2	Table 2, Section E.4.1 No participating Annex I Party is yet identified.
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	Table 2, Section E.4.1.
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, including the confirmation 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 thereof.	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	Table 2, Section A.3 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, including the confirmation that the project assists it in achieving sustainable development.

Requirement	Reference	Conclusion
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	OK. The project does not receive any public fundings.
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	OK The Brazilian designated national authority for the CDM is the Comissão Interministerial de Mudança Global do Clima.
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	OK Brazil has ratified the Kyoto Protocol on 23 August 2002.
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	No participating Annex I Party is yet identified.
9. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	CDM Modalities and Procedures §31b	No participating Annex I Party is yet identified.
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	Table 2, Section B.3.1
About forecast emission reductions and environmental impacts		

Requirement	Reference	Conclusion
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	Table 2, Section B.4 to B.7
For large-scale projects only		
12. 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.
About small-scale project activities (if applicable)		
13. 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.
14. 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.
15. If required by the host country, an analysis of the environmental impacts of the project activity is carried out and documented.	Simplified Modalities and Procedures for Small Scale CDM Project Activities §22c	Table 2, Section D.
About stakeholder involvement		
16. 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.
17. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited	CDM Modalities and	OK

Requirement	Reference	Conclusion
to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available.	Procedures §40	The PDD of 27 April 2009 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 6 May 2009 to 4 June 2009. No comment was received.
Other		
18. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK Table 2, Section B.1.1 and D.1.1
19. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK Table 2, Section B.2
20. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK Table 2, Section B.2
21. The project design document shall be in conformance with the UNFCCC CDM-PDD format.	CDM Modalities and Procedures Appendix B, EB Decision	OK The project design document conforms to version 03 of the CDM-SSC-PDD.
22. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	OK Table 2, Section D

Table 2 Requirements Checklist

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A. General Description of Project Activity <i>The project design is assessed.</i>					
A.1. Project Boundaries <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	Yes. The project is located in municipality of Patos de Minas – 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 physical, geographical site of Granja Paraíso. In accordance with AMS-III.D (Version 14), the project boundary includes the methane recovery and destruction/ combustion from swine manure treatment.		OK
A.2. Participation Requirements <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 participant is Agrocere Genética e Nutrição Animal Ltda of Brazil. The host Party Brazil meets all relevant participation requirements. No participating Annex I Party is yet identified.		OK
A.2.2. Have all involved Parties provided a valid and	/1/	DR	Prior to the submission of the final validation	—	--

* MoV = Means of Verification, DR= Document Review, I= Interview
CDM Validation 2009-0834, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
complete letter of approval and have all private/public project participants been authorized by an involved Party?			report to the CDM Executive Board, DNV will have to receive the written approval of voluntary participation from the DNA of Brazil, including the confirmation 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 fulfils all requirements.		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	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.		OK
A.3. Technology to be employed <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>					
A.3.1. Does the project design engineering reflect current good practices?	/1/	DR I	Yes. The technology reflects current good practices.		OK
A.3.2. Does the project use state of the art technology or would the technology result in a significantly	/1/	DR I	The implementation of biodigester instead of open lagoon needs special skills with respect	CL1	OK

* MoV = Means of Verification, DR= Document Review, I= Interview
CDM Validation 2009-0834, rev. 01

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
better performance than any commonly used technologies in the host country?			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. With regards to the electricity generation, the content of H ₂ S on biogas arouse severe corrosion on equipment, which needs the installation of specific filter and routine maintenance in order to assure the necessary lifetime of equipment. The PDD states that Brazilian legislation demands the use of open lagoons to treat the effluent. DNV requests evidence on this statement.		
A.3.3. Does the project make provisions for meeting training and maintenance needs?	/1/	DR I	Responsibilities and authorities for project management, monitoring and reporting activities, measurement, training and reporting techniques and QA/QC procedures are defined.		OK
A.4. Contribution to Sustainable Development <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	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	—	--

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			Brazil, including the confirmation that the project assists it in achieving sustainable 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 environmental benefits (reduction of the GHG emissions, risk of ground and water bodies contamination, etc), thus contributing to sustainable development objectives of the Brazilian Government.		OK
A.5. Small scale project activity <i>It is assessed whether the project qualifies as small-scale CDM project activity</i>					
A.5.1. Does the project qualify as a small scale CDM project activity as defined in 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/		The project activity is not a de-bundled component of a large scale project activity The project developer is not a participant in any other CDM project within 1 km from the project site.		OK
B. Project Baseline <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>					

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.1. Baseline Methodology <i>It is assessed whether the project applies an appropriate baseline methodology.</i>					
B.1.1. Does the project apply an approved methodology and the correct version thereof?	/1/	DR	<p>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” as outlined in the Appendix B of the “Simplified modalities and procedures for small-scale CDM project activities”.</p> <p>The PDD section A.4.2 should describe the type and category of the project activity as per the categorization of Appendix B to the simplified modalities and procedures for small scale CDM project activities.</p> <p>According to the methodology AMS III.D, project emissions from electricity consumption should be determined as per the procedures described in AMS I.D.</p>	CL2 CAR-1	OK
B.1.2. Are the applicability criteria in the baseline methodology all fulfilled?	/1/	DR	<p>DNV requests project participant to demonstrate that AMS-III.D (version 14) is applicable to the project in accordance with all existing criteria.</p>	CL3	OK
B.2. Baseline Scenario Determination <i>The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and</i>					

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<i>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 I	The baseline is the emissions of methane from anaerobic decay of swine manure.		OK
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/1/	DR	No other alternative scenarios have been considered.		OK
B.2.3. Has the baseline scenario been determined according to the methodology?	/1/	DR	The baseline scenario had been determined among possible scenarios from IPCC2006. The PDD states that Brazilian legislation demands the use of open lagoons to treat the effluent. DNV requests evidence on this statement.	CL1	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, macro-economic trends and political aspirations?	/1/	DR	Yes.		OK
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	Yes		OK
B.2.7. Have the major risks to the baseline been identified?	/1/	DR	Yes.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.3. Additionality Determination <i>The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.</i>					
B.3.1. Is the project additionality assessed according to the methodology?	/1/	DR	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.		OK
B.3.2. Are all assumptions stated in a transparent and conservative manner?	/1/	DR	Yes		OK
B.3.3. Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR I	<p>The additionality claims of the project are based on the following barriers:</p> <ul style="list-style-type: none"> <i>Investment barrier:</i> DNV requests evidence of the investment barriers claimed for the project activity implementation. <i>Technological barrier:</i> The implementation of biodigesters instead of open lagoon needs special skills with respect to design of 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. On the electricity generation, 	CL 4	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			<p>the content of H₂S on biogas arouses severe corrosion on equipment, which therefore needs the installation of specific filters and routine maintenance in order to assure the necessary lifetime of equipment. Hence, the project would not be implemented without external support to overcome the technical difficulties.</p> <p><i>Legal Constrains:</i> The Brazilian environment legislation for the swine activities require proper treatment of manure and do not permit discharge of effluents into water bodies.</p>		
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/ /12/	DR I	<p>The serious consideration of CDM prior to project start was demonstrated through the Board Meeting Minutes in which the project is approved to be implemented as a CDM project in 11 July 2008.</p> <p>The starting date of the project activity is 29 September 2008 which is the date of signing the construction agreement for the installation of biodigester.</p> <p>In accordance with EB 41 Para 67 the starting date of the project is the date on which the project participant has committed to expenditures related to the implementation or related to the construction of project activity. The project proponent is requested</p>	CL-5	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			<p>to clarify if the biodigestor producer contract corresponds to the first commitment on expenditures.</p> <p>Real action to secure the project CDM status was evidenced through the PricewaterhouseCoopers: proposal to support Agrocères on the CDM process in 21 November 2008.</p> <p>According to EB 41, Annex 46, Agrocères presented the project to the Brazilian DNA and informed the intention to seek CDM status in 26 January 2009.</p>		
B.4. Calculation of GHG Emission Reductions – Project emissions <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/ /2/	DR	The project emissions were calculated considering the physical leakage of biogas, the flare efficiency of 90% as established by “Tool to determine project emissions from flaring gases containing methane”. In addition it considered the emission from electricity consumed considering the EF of entire Brazilian Grid published by the Brazilian DNA.	CAR-1 CL-6	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			According to the methodology AMS III.D, project emissions from electricity consumption should be determined as per the procedures described in AMS I.D. The PDD section B.6.1 should present all equations used in calculating emission reductions, explaining and justifying all relevant methodological choices, while section B.6.3 should document how each equation is applied. The equations presented should be the same ones presented in AMS III-D and correspondent tools.		
B.4.2. Have conservative assumptions been used when calculating the project emissions?	/1/ /2/	DR	See B.4.1.	CAR-1 CL-6	OK
B.4.3. Are uncertainties in the project emission estimates properly addressed?	/1/ /2/	DR	See B.4.1.	CAR-1 CL-6	OK
B.5. Calculation of GHG Emission Reductions – Baseline emissions <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/ /15/ /16/	DR	The baseline emissions consider the open anaerobic lagoon among the scenarios from IPCC 2006, as permitted by environment regulation.	CL-7	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			<p>The calculation considers the emissions of methane from anaerobic decay of swine manure, calculated in accordance with the most recent IPCC tier 2 approach (IPCC 2006 Guidelines) and applying IPCC default values for the parameters B₀ and VS for European genetic and management used by Agrocères, and respective MCF for anaerobic open lagoons and ambient temperature for Patos de Minas. DNV could confirm that the swine genetic at Granja Paraíso is imported from Europe, US and Canada.</p> <p>The parameters number of animals, number of days of operation and percent of animal effluent used in the system are monitored parameters. Therefore, they should be described only in section B.7.1, not in section B.6.2. The methane density should be included in section B.6.2.</p>		
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	See B.5.1.	CL 7	OK
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	See B.5.1.	CL 7	OK
B.6. Calculation of GHG Emission Reductions – Leakage <i>It is assessed whether leakage emissions are stated according to the methodology and whether the</i>					

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<i>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 complete and transparent manner?	/1/	DR	Leakage is not accounted for this project and it is correct.		OK
B.6.2. Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	See B.6.1.		OK
B.6.3. Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	See B.6.1.		OK
B.7. Emission Reductions <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 ₂ emissions to the extent of 121,210 tCO ₂ e during the first 7 years crediting period.		OK
B.8. Monitoring Methodology <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 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” as outlined in the		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			Appendix B of the “Simplified modalities and procedures for small-scale CDM project activities”.		
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 two years after the end of the crediting period.		OK
B.9. Monitoring of Project Emissions <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 I	<p>The project specifies that the biogas burned will be measured through calibrated flow meter.</p> <p>The fraction of methane in the biogas, temperature and pressure will be measured monthly to assure 95% confidence level of methane concentration in biogas.</p> <p>The sludge disposition will be registered in an electronic spreadsheet. Both monitoring approaches were considered appropriate and effective.</p> <p>According to the methodology AMS III.D and the “Tool to determine project emissions from flaring gases containing methane” the temperature and pressure of captured and flared biogas should be monitored in order to</p>	CAR-2 CAR-3 CL-8	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			<p>establish the density of biogas.</p> <p>In addition, the temperature of the enclosed flare should be monitored in order to assure the 90% of flare efficiency.</p> <p>As the biogas produced by the biodigester contains methane, carbon dioxide and 2% of residual gases, the measurement of the fraction of the methane content in the biogas produced during the anaerobic digestion should be done either through the methane direct measure equipment or the Orsat CO₂ analysis should be complemented with a periodical chromatographic measurement, in order to establish the complement equivalent to the remaining gases that will be discounted to calculate the methane content.</p> <p>The following monitoring parameters are not described in the PDD section B.7.1: grid emission factor for electricity, and continuous check of the flare compliance with the manufacturer's specification (temperature, biogas flow rate). Besides that, the genetic source of the production operation livestock and the formulated feed rations should be monitored.</p>		
B.9.2. Are the choices of project GHG indicators reasonable and conservative?	/1/	DR	CO ₂ is the only GHG indicators that need to be accounted for.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
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	Responsibilities and authorities for project management, monitoring and reporting activities, measurement and reporting techniques and QA/QC procedures are defined.		OK
B.9.8. Are procedures identified for <i>maintenance</i> of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	Yes		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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.10. Monitoring of Baseline Emissions <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	See B.9.1	CL 8	OK
B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/1/	DR	Methane and CO ₂ are the baseline indicators that need to be accounted for.		OK
B.10.3. Is the measurement method clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/1/	DR	Yes. As requested by the AMS-III.D (Version 14) the emission reductions should be compared with the yearly methane generation potential calculated in the project design document for that year.		OK
B.10.4. Is the measurement <i>equipment</i> described and deemed appropriate?	/1/	DR	Yes.		OK
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	See B.10.1.		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	/1/	DR	See B.10.1.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<i>reporting procedure defined?</i>					
B.10.8. Are procedures identified for <i>maintenance</i> of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	Yes		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	Yes.		OK
B.11. Monitoring of Leakage <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 necessary for determining leakage?	/1/	DR	Concerning leakage, no sources of emissions were identified according to AMS-III.D (Version 14).		OK
B.11.2. Are the choices of project leakage indicators reasonable and conservative?	/1/	DR	See B.11.1.		OK
B.11.3. Is the measurement method clearly stated for each leakage value to be monitored and deemed appropriate?	/1/	DR	See B.11.1.		OK
B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts <i>It is assessed whether choices of indicators are reasonable</i>					

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<i>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 (Version 14) and the Brazilian DNA do not require the monitoring of social and environmental indicators.		OK
B.12.2. Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	See B.12.1		OK
B.12.3. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR	See B.12.1		OK
B.13. Project Management Planning <i>It is checked that project implementation is properly prepared for and that critical arrangements are addressed.</i>					
B.13.1. Is the authority and responsibility of overall project management clearly described?	/1/	DR	Responsibilities and authorities for project management, monitoring and reporting activities, measurement, training and reporting techniques and QA/QC procedures are defined.		OK
B.13.2. Are procedures identified for training of monitoring personnel?	/1/	DR	Yes		OK
B.13.3. Are procedures identified for emergency	/1/	DR	There are no procedures mentioned for	CL-9	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
preparedness for cases where emergencies can cause unintended emissions?			project performance reviews and corrective actions or procedures for emergency preparedness for cases where emergencies can cause unintended emissions.		
B.13.4. Are procedures identified for review of reported results/data?	/1/	DR	See B.13.3	CL-9	OK
B.13.5. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR	See B.13.3.	CL-9	OK
C. Duration of the Project/ Crediting Period <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/ /10/	DR I	The project starting date was on 29 September 2008, corresponding to the date of the contract signing with the biodigester producer. In accordance with EB 41 Para 67 the starting date of the project is the date on which the project participant has committed to expenditures related to the implementation or related to the construction of project activity. The project proponent is requested to clarify if the biodigester producer contract corresponds to the first commitment on expenditures.	CL-5	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			The project has an expected lifetime of 10 years.		
C.1.2. Is the start of the crediting period clearly defined and reasonable?	/1/ /11/	DR	A renewable 7 years crediting period was selected, starting on 1 December 2009 or the date of registration of the project. A renewable 7 year crediting period is selected. However, the expected operational lifetime of the project activity is 10 years. DNV requests clarification on that.	CL 10	OK
D. Environmental Impacts <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/ /13/	DR	No. The farm operational license is under renewal process under the Environmental Secretary of Minas Gerais.		OK
D.1.2. Does the project comply with environmental legislation in the host country?	/1/ /13/	DR	See D.1.1.		OK
D.1.3. Will the project create any adverse environmental effects?	/1/ /13/	DR	As stated in the PDD, the project will reduce the environmental impacts, like organic load of wastewater, odor and others.		OK
D.1.4. Have environmental impacts been identified and addressed in the PDD?	/1/ /13/	DR	See D.1.3.		OK
E. Stakeholder Comments					

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
<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/ /14/	DR I	Local stakeholders, such as the City Hall and Municipal Assembly, District Attorney, the environmental state and local agencies, the Brazilian forum of NGOs and local communities associations, were invited to comment on the project, in accordance with the requirements of Resolution 7 of the Brazilian DNA. The letters sent to the local stakeholders, the comments received and how due account was taken were evidenced by DNV. The PDD sections E.2 and E.3 should present a summary of the comments received during stakeholders consultation and how this was taken into account.	CL-11	OK
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/ /14/	DR	See E.1.1	CL-11	OK
E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/ /14/	DR	See E.1.1	CL-11	OK
E.1.4. Is a summary of the stakeholder comments received provided?	/1/ /14/	DR	See E.1.1	CL-11	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
E.1.5. Has due account been taken of any stakeholder comments received?	/1/ /14/	DR	See E.1.1	CL 11	OK

* MoV = Means of Verification, DR= Document Review, I= Interview
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Table 2b: Additional requirements checklist for VVM version 1 (EB 44)

A.1. Letter of approval					
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, including the confirmation that the project assists it in achieving sustainable development.	--	--
A.2. Project design					
A.2.1 Does the PDD describe the CDM project activity with all relevant elements in a transparent and accurate way?	/1/	DR	Yes, 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/	DR	No. The starting date of the project activity indicated in the PDD is 29 September 2008. In accordance with EB 41 Para 67 the starting date of the project is the date on which the project participant has committed to expenditures related to the implementation or related to the construction of project activity. The project proponent is requested to clarify this event and describe in section C.1.1 of the PDD the evidence available to support this starting date. See Table 2 C.1.1.		OK
A.2.3 Is the project a large scale project, a small scale project with average annual emission reductions above 15,000 tonnes or a bundled small scale project? Has on-site visit been carried out?	/1/	DR	The project is a small scale project. The project participant does not have any another small scale project with the same methodology, hence the project is not a de-bundled component of a larger project		OK

			activity. The site visit was carried out in 18 and 19 June 2009.		
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/	DR	No, the project activity will use new equipment. See Table 2 A.3.1.		OK
A.3. Project emissions not addressed by the methodology					
A.3.1 Does the methodology describe all project emission source for the project activity that contributes all 1% of the emission reductions? Sources that the methodology considers not to take into account are not relevant (e.g. cement and iron consumption for building hydropower plants).	/1/	DR	Yes. See Table 2 B.4 and B.5.		OK
A.4. Documentation of baseline emissions					
A.4.1 Documentation of the baseline determination: <ul style="list-style-type: none"> a. All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. b. All documentation is relevant as well as correctly quoted and interpreted. c. Assumptions and data can be deemed reasonable d. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. e. The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity 	/1/	DR	Yes. See Table 2- B.1.1, B.2.1, B.2.2 and B.5.		OK
A.5. Documentation of the calculations					
A.5.1 Algorithms and/or formulae used to determine emission	/1/	DR	Yes, see Table 2 B.4 and B.5.		OK

<p>reductions</p> <ul style="list-style-type: none"> • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced • All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity • The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration. 					
A.6. Implementation of the monitoring plan					
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/	DR	Yes, see Table 2 B.8, B.9 and B.10.		OK
A.7. CDM consideration prior to starting date					
A.7.1 The prior consideration of CDM for the project activity complies with EB41 annex 46	/1/	DR	See Table 2 B.3.4.		OK

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
<p>CAR 1</p> <p>According to the methodology AMS III.D, project emissions from electricity consumption should be determined as per the procedures described in AMS I.D.</p>	<p>B.1.1 B.4.1 - B.4.3</p>	<p>The corrections on calculation of the project emissions from electricity consumption were made in sections “B.6.1 Explanation of methodological choices” and “B.6.3. <i>Ex ante</i> calculation of emission reductions”</p> <p>The methodology AMS I.D determines that the emissions have to be calculated using the electricity consumption multiplied by the emission factor from the grid.</p>	
<p>CAR 2</p> <p>According to the methodology AMS III.D and the “Tool to determine project emissions from flaring gases containing methane” the temperature and pressure of captured and flared biogas should be monitored in order to establish the density of biogas.</p> <p>In addition, the temperature of the enclosed flare should be monitored in order to assure the 90% of flare efficiency.</p>	<p>B.9.1</p>	<p>It was included in the section “B.7.1 Data and parameters monitored” the monitored parameters “p_{flare}” and “T_{flare}” to the temperature and “p_{flare}” to the pressure of captured and flared biogas, and “η_{flare}” to monitoring the flare efficiency.</p>	<p>The temperature and pressure of the captured and flared biogas were included in the revised monitoring plan. Therefore this CAR is closed.</p>
<p>CAR 3</p> <p>As the biogas produced by the biodigester contains methane, carbon dioxide and 2% of residual gases, the measurement of the fraction of the methane content in the biogas produced during the anaerobic digestion should be done either trough the methane</p>	<p>B.9.1</p>	<p>The biogas will be measured by gas analyzer equipment – GEM 2000 from Landtec. The parameter “w_{CH_4}” in section “B.7.1 Data and parameters monitored” was changed and this information was included replacing the Orsat CO₂ analysis.</p>	<p>DNV could confirm that methane content will be directly monitored, as per the revised PDD and the Landtec equipment purchase order. 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
direct measure equipment or the Orsat CO ₂ analysis should be complemented with a periodical chromatographic measurement, in order to establish the complement equivalent to the remaining gases that will be discounted to calculate the methane content.			
CL 1 The PDD states that Brazilian legislation demands the use of open lagoons to treat the effluent. DNV requests evidence on this statement.	A.3.2 B.2.3	There is no statement that Brazilian legislation demands the use of open lagoons to treat the effluent. That information was removed of the PDD.	The PDD was revised accordingly. Therefore this CL is closed.
CL 2 The PDD section A.4.2 should describe the type and category of the project activity as per the categorization of Appendix B to the simplified modalities and procedures for small scale CDM project activities.	B.1.1	The correction was made in the PDD, in the section “B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity”. The categorization is type III, category D.	The PDD was revised accordingly. Therefore this CL is closed.
CL 3 DNV requests project participant to demonstrate that AMS-III.D (version 14) is applicable to the project in accordance with all existing criteria.	B.1.2	The correction was made in the PDD in section “B.2 Justification of the choice of the methodology and why it is applicable to the project activity”. All the criteria of the methodology were included in the document.	The PDD was revised accordingly, and related evidences were provided and found to be adequate. Therefore this CL is closed.
CL 4 DNV requests evidence of the investment barriers claimed for the project activity implementation.	B.3.3	An investment confrontation was elaborated to compare the investment made in the construction of the anaerobic lagoons (baseline scenario)	A simple cost analysis was provided with related evidence confirming that the investment in the project scenario is much higher than in the baseline

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
		and the construction of the biodigestors. It was inserted in the section “B.5.3 Investment Barriers”.	scenario. Therefore this CL is closed.
CL 5 In accordance with EB 41 Para 67 the starting date of the project is the date on which the project participant has committed to expenditures related to the implementation or related to the construction of project activity. The project proponent is requested to clarify if the biodigestor producer contract corresponds to the first commitment on expenditures.	B.3.4 C.1.1	The first commitment on expenditures of the project activity was the contract with Baltazar Reis de Mendonça Ltda, on 01/09/2008. The correction was made in the PDD, in the sections “C.1.1 Starting date of the project activity” and “B.5.1 Timeline project”.	The correspondent contract was provided and DNV confirms that this was the first commitment on expenditures. Therefore this CL is closed.
CL 6 The PDD section B.6.1 should present all equations used in calculating emission reductions, explaining and justifying all relevant methodological choices, while section B.6.3 should document how each equation is applied. The equations presented should be the same ones presented in AMS III-D and correspondent tools.	B.4.1 - B.4.3	In section “B.6.1 Explanation of methodological choices” the equations were revised and they follow the methodology AMS III.D. In the section “B.6.3 Ex ante calculation of emission reduction” the calculation were made following the methodology	The PDD was revised accordingly. Therefore this CL is closed.
CL 7 The parameters number of animals, number of days of operation and percent of animal effluent used in the system are monitored parameters. Therefore, they should be described only in section B.7.1, not in section	B.5.1 - B.5.3	The methane density parameter (“DCH4”) was included into the section “B.6.2 Data and parameters that are available at validation” and the parameters “n(T)”, “MS%” and “NLT,y” were described only in section	The PDD was revised accordingly. Therefore this CL is closed.

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
B.6.2. The methane density should be included in section B.6.2.		“B.7.1 Data and parameters monitored”.	
<p>CL 8</p> <p>The following monitoring parameters are not described in the PDD section B.7.1: grid emission factor for electricity, and continuous check of the flare compliance with the manufacturer’s specification (temperature, biogas flow rate). Besides that, the genetic source of the production operation livestock and the formulated feed rations should be monitored.</p>	<p>B.9.1</p> <p>B.10.1</p>	<p>The parameters flare temperature, biogas flow rate, grid emission factor, genetic source and formulated feed rations were included in the section “B.7.1 Data and parameters monitored”. Besides that, genetic source and formulated feed rations were included in section “B.7.2 Description of the monitoring plan”.</p>	<p>The PDD was revised accordingly. 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>CL 9</p> <p>There are no procedures mentioned for project performance reviews and corrective actions or procedures for emergency preparedness for cases where emergencies can cause unintended emissions.</p>	<p>B.13.3 – B.13.5</p>	<p>Procedures for emergency and performance reviews were included in the PDD in the section “B.7.2 Description of the monitoring plan”.</p>	<p>The PDD was revised accordingly. Therefore this CL is closed.</p>
<p>CL 10</p> <p>A renewable 7 year crediting period is selected. However, the expected operational lifetime of the project activity is 10 years. DNV requests clarification on that.</p>	<p>C.1.2</p>	<p>The expected operational lifetime is expected to be 10 years but some material used can be changed in order to provide a longer lifetime with the same technology described along the PDD.</p>	<p>Clarifications were provided for DNV’s satisfaction. Therefore this CL is closed.</p>
<p>CL 11</p> <p>The PDD sections E.2 and E.3 should present a summary of the comments received during stakeholders consultation and how this was taken into account.</p>	<p>E.1.1 – E.1.5</p>	<p>The comments received during stakeholders consultation was inserted in the PDD, in section “E.2 Summary of the comments received”. The considerations are in section “E.3 Report on how due account was taken of any comments received”.</p>	<p>The PDD was revised accordingly. Therefore this CL is closed.</p>
<p>CL 12</p> <p>The estimated amount of emission reductions should be presented without decimal numbers.</p>		<p>The values were remove the decimal numbers</p>	<p>The PDD was revised accordingly. Therefore this CL is closed.</p>

APPENDIX B

CERTIFICATES OF COMPETENCE



CERTIFICATE OF COMPETENCE

Felipe Antunes

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

GHG Auditor:	Yes				
Technical Area	CDM Validator	CDM Verifier	Sector Expert	Methodology Expert	Technical Reviewer
Landfill gas					
Hydro power	Jan 2009				
Renewables				Jan 2009	Jan 2009
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	Jan 2009	Jan 2009			
Energy efficiency					
N ₂ O					
HFCs					
Flare reduction					
PFCs					
Charcoal					
CO ₂ recovery					
Transport					
Non-renewable biomass					
Biofuel					
Pipeline leakage reduction					
SF ₆					

Høvik, 9 January 2009

Michael Lehmann

Michael Lehmann

Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Kumaraswamy Chandrashekara

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-8-1-CDMJ1-i1)

GHG Auditor:	yes				
Technical Area	CDM Validator	CDM Verifier	Sector Expert	Methodology Expert	Technical Reviewer
Landfill gas	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Hydro power	Jan 2009	Jan 2009			
Renewables Wind power	Jan 2009	Jan 2009		Jan 2009	
Other renewable	Jan 2009	Jan 2009			
Biomass	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	
Waste-heat / waste-gas recovery	Jan 2009	Jan 2009	Jan 2009	Jan 2009	
Efficiency of thermal power plants	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	
Manure management	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	
N ₂ O	Jan 2009	Jan 2009		Jan 2009	
HFCs	Jan 2009	Jan 2009	Jan 2009	Jan 2009	
Flare reduction	Jan 2009	Jan 2009		Jan 2009	
PFCs	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Charcoal	Jan 2009	Jan 2009	Jan 2009	Jan 2009	
CO ₂ recovery	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
Transport	Jan 2009	Jan 2009		Jan 2009	
Non-renewable biomass	Jan 2009	Jan 2009		Jan 2009	
Biofuel	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Pipeline leakage reduction	Jan 2009	Jan 2009		Jan 2009	
SF ₆	Jan 2009	Jan 2009		Jan 2009	Jan 2009

Høvik, 9 January 2009

Michael Lehmann

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