DET NORSKE VERITAS

VALIDATION REPORT

DET NORSKE VERITAS
DNV CERTIFICATION AS

Veritasveien 1
N-1322 Høvik
Norway
http://www.dnv.com

"Samarco Mineração S/A fuel switch project" in Brazil

REPORT NO. 2009-0790

REVISION NO. 01

DET NORSKE VERITAS

VALIDATION REPORT

DET NORSKE VERITAS
DNV CERTIFICATION AS

Veritasveien 1
N-1322 Høvik
Norway
http://www.dnv.com

Date of first issue: 18 May 2009	Project No.: PRJC-137989-2009-CCS-BRA
Approved by: Hendrik W. Brinks	Organisational unit: Climate Change Services
Client: Samarco Mineração S/A and MundusCarbo	Client ref.: Rodrigo Dutra Amaral

Project Name: Samarco Mineração S/A fuel switch project
Country: Brazil
Methodology: ACM0009 – "Consolidated baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas"
Version: 3
GHG reducing Measure/Technology: Fuel switch from RFO and coal to natural gas
ER estimate: 157 881 tCO_2/year or 1 105 167 tCO_2 over 7 years
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 "Samarco Mineração S/A fuel switch project", as described in PDD of version 05 of 22 February 2010, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology ACM0009 version 3. 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, including the confirmation that the project assists it in achieving sustainable development.

Report No.:	Date of this revision:	Rev. No.
2009-0790	24-Feb-2010	01

Report title:
Samarco Mineração S/A fuel switch project

Work carried out by:
Luis Filipe Tavares

Work verified by:
Kakaraparthi Venkata Raman (applicant draft & final)
Chandrashekara Kumaraswamy (draft)

Key words:

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

☐ Limited distribution

☐ Unrestricted distribution

VALIDATION REPORT

Abbreviations

ANP	Brazilian Petroleum Agency
ASPE	Energy Public Service Agency of Espírito Santo State
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CREA	Regional Council of Engineering and Architecture
DNV	Det Norske Veritas
DNA	Designated National Authority
IEMA	Environment State Institute of Espírito Santo State
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
NGO	Non-governmental Organisation
NPV	Net Present Value
ODA	Official Development Assistance
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change

VALIDATION REPORT

TABLE OF CONTENTS

VALIDATION REPORT

1 EXECUTIVE SUMMARY – VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the "Samarco Mineração S/A fuel switch project". 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 Samarco Mineração S/A and MundusCarbo 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 fuel switch from RFO and mineral coal to natural gas.

The project applies the approved baseline and monitoring methodology ACM0009 (version 3), i.e. "Consolidated baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas". 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 switching coal or petroleum fuel to natural gas, the project results in reductions of CO_2 emissions that are real, measurable and give long-term benefits to the mitigation of climate change.

Emission reductions are directly monitored and calculated ex-post, using the approach given in ACM0009 (version 3).

In summary, it is DNV's opinion that the Samarco Mineração S/A fuel switch project, as described in the revised project design document of 22 February 2010, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology ACM0009 (version 3). Hence, DNV will request the registration of the "Samarco Mineração S/A fuel switch 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.

2 INTRODUCTION

Samarco Mineração S/A and MundusCarbo have commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the Samarco Mineração S/A fuel switch project, (hereafter called "the project").

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

The validation team consisted of the following personnel:

				Type of involvement					
Role/Qualification	***Last Name***	***First Name***	***Country***	Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	Expert input
CDM validator/ technical team leader/ Sector expert	Tavares	Luis Filipe	Brazil	x	x	x	x		x
Technical reviewer (draft)	Chandrashekara	Kumaraswamy	India					x	
Technical review (draft applicant and final)	Kakaraparthi	Venkata Raman	India					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 monitoring methodology ACM0009 (Version 3) /41/. The validation team has, based on the recommendations in the Validation and Verification Manual /40/.

VALIDATION REPORT

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 consists 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/ MundusCarbo/Samarco PDD for the Samarco Mineração S/A fuel switch project. Version 01 of 16 January 2009.

/2/ MundusCarbo/Samarco PDD for the Samarco Mineração S/A fuel switch project. Version 02of 22 May 2009.

/3/ MundusCarbo/Samarco PDD for the Samarco Mineração S/A fuel switch project. Version 05 22 February 2010.

/4/ Samarco spreadsheet ex ante calculation emission reduction v3 ;

/5/ Samarco spreadsheet Financial Analysis v5.2;

/6/ Samarco spreadsheet CAPEX gas v3 supported by the follow /7//8//9//10/;

/7/ Samarco CAPEX natural gas installation investment budged RPF031-001008;

/8/ Samarco CAPEX natural gas control system proposal Emerson Process Manag.10/10/08;

/9/ Samarco CAPEX natural gas burners proposal Dynamis Mec Aplc.E/410/0;

/10/ Samarco CAPEX natural gas pipeline proposal Maxon 6381/Prg/27001/08;

/11/ Samarco WACC report and financial statements of the following projects list:

- #4 Pelletizing
- Electrostatic precipitator
- Access to Germano basic net
- Concentrator expansion for 1 Mtpa.

/12/ Samarco thermo balance and efficiency ;

/13/ Samarco SAP O&M SAP cost system reports indurance facilities 1 and 2 from Jan 07 to Dec 08

/14/ Samarco Coal Direct Injection Trial Pos Implementation Review (PIR) report

/15/ Samarco coal/fuel/NG price spreadsheet

/16/ Samarco (Jose Tadeu de Moraes – Director President) and Petrobras Distribuidora SA (Marco Antonio O Couto – Energy Business manager) contract to natural gas supplying, signed on 15 December 2009

/17/ Samarco: Purchase Order for Açotubo (pipeline supplier) dated 08 January 2010

/18/ MundusCarbo: Samarco GHG inventory and CDM opportunity identification report issued on July 2008

/19/ Coal price:
Glencore Int. AG commercial invoices:
Vessel - MV Africa Blue Crane 1000XI1257401 (08 Sep 2008);
Vessel - MV Tay Harmony 1000XI1679101 (10 Nov 2008)
Harbor handling operation costs spreadsheet for both vessel

/20/ Shell invoices of fuel oil supplied to Samarco :
Fuel oil 7A
- number 0012420/ 0012421 issued on 28 Sep 2009;
- number 013136 issued on 10 Oct 2008;
- number 016466/016467 issued on 24 Dec 2008;
Fuel oil 6A
- number 001804 issued on 16 Oct 2008,
- number 001812 issued on 22 Oct 2008;
- number 001812 issued on 22 Oct 2008.

/21/ ANP combustibles price reference
http://www.anp.gov.br/?pg=15010&m=&t1=&t2=&t3=&t4=&ar=&ps=&cachebust=1264449008822

/22/ Petrobras Distribuidora Natural gas specifications
http://web.archive.org/web/20080526152530/www.br.com.br/portalbr/calandra.nsf

/23/ ASPE resolutions of NG price 01/07, 03/07, 07/07, 01/08, 02/08, 05/08, 07/08, 01/09, 02/09 and 03/09
http://www.aspe.es.gov.br/default.asp?arq=resolucoeaspe

/24/ Indurance furnace lifetime statement for 18 years at least by the Maintenance Manager (CREA registration number 080461728-7)

/25/ Brazilian Natural Gas net http://www.gasnet.com.br/novo_gasoduto/operacao.asp

/26/ Espírito Santo natural gas http://www.ecen.com/eee17/petrgasee.htm

/27/ Mine and Energy Ministry - Brazilian energy policy: table 1.1 of Brazilian "Energy National Balance 2008" http://www.mme.gov.br/mme/galerias/arquivos/publicacoes/BEN/2_-_BEN_2008_-_Ano_Base_2007/3_-_BEN_2008_Ingles_-_Completo.pdf

/28/ Brazilian Energy Regulation
Decree Nº 3.371, from February 24th of the year 2000. Institutes, in the ambit of the Ministry of Mines and Energy, the Thermoelectricity Priority Program, and gives other providences.

/29/ Brazilian gas market
http://ultimosegundo.ig.com.br/economia/2008/09/11/explosao_forca_bolivianos_a_reduzir_envio_de_gas_para_o_brasil_1762971.html

/30/ Brazilian bonds and currency
http://www.bcb.gov.br/ingles/inffina/FinancialStatements12312006.pdf
http://www.bcb.gov.br/Pec/metas/TabelaMetaseResultados.pdf

/31/ Brazilian correction rates
http://www.portalbrasil.net/igpm.htm
http://www.bcb.gov.br/htms/relinf/port/2007/03/ri200703b6p.pdf

/32/ Brazilian Securities and Exchange Commission
http://www.cvm.gov.br/dados/LaudEditOpa/RJ-2006-00439/20060127_LAUDO_DE_AVALIACAO.pdf
http://www.wallst-training.com/Ibbotson2005.pdf

/33/ Depreciation guidance http://www.receita.fazenda.gov.br/Legislacao/ins/Ant2001/1998/in16298.htm

/34/ Espírito Santo State Energy Matrix spreadsheet
http://www.aspe.es.gov.br/balanco/3/364.html

/35/ Vale http://www.vale.com/vale_us/cgi/cgilua.exe/sys/start.htm?sid=485

/36/ Pelletizing http://www.outotec.com/36253.epibrw

/37/ Bolivian Natural Gas scenario: http://www.emerisk.com/country/bolivia
http://www.petroleum-economist.com/default.asp?page=14&PubID=46&ISS=25487&SID=722621

/38/ Brazilian natural gas pipeline
http://www.gasbrasil.com.br/gasnatural/mapa_gasoduto.asp

/39/ Selic Brazilian Bonds http://www.receita.fazenda.gov.br/pagamentos/jrselic.htm

/40/ *CDM Validation and Verification Manual*.
http://cdm.unfccc.int/Reference/Manuals/accr_man01.pdf

/41/ CDM-EB: Approved Consolidated Baseline and Monitoring Methodology ACM0009 - *"Consolidated baseline methodology for fuel switching from coal or petroleum fuel to natural gas"*. Version 3

/42/ CDM EB 50 Annex 15 *Tool to determine the remaining lifetime of equipment*

/43/ CDM EB: *Tool for the demonstration and assessment of additionality*. Version 5.

/44/ CDM EB41: *Guidance on the Assessment of Investment Analysis*
http://cdm.unfccc.int/EB/041/eb41_repan45.pdf

/45/ CDM website comments invitation
http://cdm.unfccc.int/Projects/Validation/DB/2C0UV10XEZSBI80VW1918ISKJF0WMI/view.html

Persons interviewed during the validation, or persons who contributed with other information that are not included in the documents listed above:

/46/ Rodrigo Dutra Amaral - Samarco

/47/ Nelson Flavio – Samarco

/48/ José Carlos Juliani – Samarco

/49/ Marcus Cancela - Samarco

/50/ Breno Rates – Mundus Carbo

The main differences between the PDD published and the revised PDD submitted for registration are:

- Changing lifetime of project
- Adjust NPV calculation according lifetime
- Clarification about baseline

3.2 Follow-up Interviews with Project Stakeholders

On 8 April 2009, DNV performed a site visit to the Samarco facilities at Ubu-ES and the interviews with project stakeholders to confirm selected information and to resolve issues

identified in the document review. The site interviews were carried out by Luis Filipe Tavares (qualified validator for the relevant technical area) of DNV Rio. Representatives of Samarco Mineração S/A /46/, /38/ /39/ /40/ and representatives of MundusCarbo /48/ were interviewed.

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

Organization	Topic
Samarco	• Projects boundary • Project starting date • Crediting period starting date • Additionality • Monitoring plan • Environmental Licenses
MundusCarbo	• ER estimation • Stakeholders consultation

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 customized 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 organizes, 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 "*Samarco Mineração S/A fuel switch project"* 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

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

Validation Protocol Table 2: Requirement checklist				
Checklist Question	***Reference***	***Means of verification (MoV)***	***Comment***	***Draft and/or Final Conclusion***
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.	*Gives reference to documents where the answer to the checklist question or item is found.*	*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.*	*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.*	*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.*

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***
If the conclusions from the draft Validation are either a CAR or a CL, these should be listed in this section.	*Reference to the checklist question number in Table 2 where the CAR or CL is explained.*	*The responses given by the project participants during the communications with the validation team should be summarised in this section.*	*This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".*

Figure 1 Validation protocol tables

3.4 Internal Quality Control

The validation report underwent a technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

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 project design documentation of 22 February 2010.

4.1 Participation Requirements

The project participants are Samarco Mineração S/A and MundusCarbo of Brazil The host Party Brazil meets all relevant participation requirements. No Annex I country was identified yet.

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.

4.2 Project Design

The project activity involves the switch of the mineral coal used as heat source by natural gas. The coal used for pellet composition will not be switched. As natural gas is a less carbon-intensive, fuel switch will results in the GHG emissions reductions.

The project boundary correspond the pelletizing units 1, 2 and 3, located at Ponta Ubu plant near Ubu harbor, on Anchieta municipality, Espírito Santo State, Brazil /20/.

The starting date of the project activity is 15 December 2009 with respect Natural Gas Supply Contract between Samarco Mineração S/A and Petrobrás Distribuidora S/A /16/ as according EB 41 paragraph 67.
The operations are expected to commence on 1 February 2010, with an expected operational lifetime of 18 years /24/. A renewable 7-year crediting period is selected, starting on 1 May 2010 or the date of registration whichever is later,.

The project is expected to bring social (new jobs), economical and environmental benefits, thus contributing to the sustainable development objectives of the Brazilian Government.

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.

4.3 Baseline Determination

The project applies the approved consolidated baseline methodology ACM0009 (Version 3) – "Consolidated *baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas"* /41/.
This methodology is applicable to the Samarco Mineração S/A fuel switch project considering the follow:

i) Samarco uses coal and fuel oil to meet energy requirements of pellet production, which is the baseline scenario. The pipeline of natural gas is not available on Ubu facilities. The point of Petrobras natural gas pipeline could reach was Vitoria municipality, 50 km away /25/ /26/;

ii) No regulations constrain the use of natural gas. The energy Brazilian policy are carry on effort to improve the production and use of natural gas on national energy

matrix /27/;

iii) No regulation to require the use of natural gas or any other fossil fuel in the pellet production process element /25/;

iv) The use of natural gas on the induration pellet process will not increase the thermal capacity or lifetime of facilities. Pelletizing plants have an annual production capacity of iron ore pellets as 1 = 7.1 million ton/y, 2 = 7.1 million ton/y and 3 = 7.6 million ton/y /24/;

v) The project activity does not result in integrated process change. The three pellet facilities will be with the same production independent lines/20/;

According the ACM0009 (Version 3), the baseline scenario, as the most plausible scenario has been selected and justified as follow:

Step 1: Four scenarios were identified:

a) Continuation of current practice of using coal and petroleum fuel oil;
b) Switching from coal and fuel oil to biomass;
c) Project activity not undertaken under CDM;
d) Switching from coal and fuel oil to natural gas at a future point in the time of credit period.

Step 2: Elimination of the alternatives that are not compliant with applicable laws and regulations.
As no regulations are applicable to restrict the change of fuel, no scenario was eliminated.

Step 3: Elimination the alternatives that face prohibitive barriers:

Investment Barrier: As verified, the average coal price is around US$ 13/Gcal /15/, the average fuel oil price is around US$ 55/Gcal /20/ and the natural gas price is around US$ 35/Gcal/23/. The continuation or enhancement of the share of coal use (%) was therefore likely scenario.

Technological Barrier: The scenario of use of biomass to substitute the fossil fuel is limited to the use of reforest eucalyptus or sugar cane bagasse as biomass sources and burn on external burner of pellet facilities. Nonetheless the biomass ash is not possible to incorporated into the pellet, and as consequence, this is not common practice in pellet industry as verified the null consumption of biomass to pellet production in Brazil on yearly energy balance report issued by the Mine and Energy Ministry /27/.

Prevailing Practice Barriers: The natural gas used as fuel in Brazil has two main sources: a) import from Bolivia gas fields and transported by Petrobras pipe gas.
b) Production on onshore and offshore Petrobras oil and gas fields. The transportation is also responsibility of Petrobras. The distribution is only done by a state gas company. As verified on the gas market, the influence of Bolivian government /29/ and the Brazilian Thermoelectricity Priority Program /28/, the use of natural gas on different production activities than electricity generation has low priority on Brazilian government, hence the prevailing practice of coal and oil fuel consumption has the lower risk of discontinuation of supplying comparing with the project activity.

In addition, the prevailing practice of the use of coal and fuel oil represent reach 65% of energy demand (ton of oil equivalent) compared with 7% of natural gas on pellet industry /27/

Others Barriers: Considering the argumentation of prevailing practice and the restriction of use specific burner to use fuel oil, coal and natural gas, the change of fuel could not be on reversible condition, and if the was not implemented due the logistic risks, this condition could be the same during the credit period, and the project is not the likely scenario on the future

Considering the barrier analyses, the continuation of the current practice of using coal and petroleum fuel is acceptable as the likely baseline scenario. This is further supported in the additionality discussion where it has been demonstrated that the project is less financially attractive than the continuation of the pre-project scenario.

4.4 Additionality

In accordance with ACM0009 (Version 3), the additionality of the project is demonstrated through the *"Tool for the demonstration and assessment of additionality*" version 5.2 /43/.

4.4.1 CDM consideration and continued action to secure CDM status

DNV could confirm that the project activity was identified as a CDM project in June 2008 by MundusCarbo consultancy /18/ and the project validation started on 1 April 2009 with reference of PDD web hosted for global stakeholder comments by DNV,.
The project starting date is 15 December 2009, which is the date of signing the natural gas supply contract between Samarco Mineração S/A and Petrobrás Distribuidora S/A. /16/.. The pipeline purchase order was issued in 8 January 2010 /17/, and no other contracts have been signed yet. Therefore, DNV acknowledges that the first commitment on expenditures was in 15 December 2009.
Since the project activity has a starting date after 2 August 2008, it is considered as a new project as per the guidelines in EB 41 Annex 46. However, as the Samarco PDD /1/ was web hosted for global stakeholder comments prior to the start date, a notification to the host DNA and/or UNFCCC secretariat was not necessary.

Given the above time, sufficient efforts to secure CDM status in parallel with the implementation has been demonstrated.

4.4.2 Investment analysis: Choice of approach

Since the proposed project generates financial benefits through the saving on the fuel cost other and the baseline alternative involve investment due the expansion of the use of coal, supported by the lower price of coal compared with fuel oil, an investment comparison analysis is applicable.

4.4.3 Investment analysis: Benchmark selection

The net present value (project NPV) has been used as the financial indicator.

The discount rate of 9.05%/y was verified through the WACC Samarco report /11/. Considering that the project activity could be implemented only by Samarco, as it consists of

change of fuel on existing facility, an internal company benchmarks as a weighted average cost of capital (WACC) was applied. In addition, during the site visit DNV assessed the financial statements of the following similar previous projects, confirming that Samarco had been using this benchmark /11/ as follows:

- #4 Pelletizing
- Electrostatic precipitator
- Access to Germano basic net
- Concentrator expansion for 1 Mtpa.

In addition comparing with the SELIC Brazilian bonds for 2008 of 12.05% /39/, DNV could verify that the applied WACC is reasonable. Hence the selection and appropriateness of the benchmark is justified.

4.4.4 Investment analysis: Input parameters

All documents pertaining to the source of input values presented in the analysis have been verified by DNV from the project activity, and were compared with the baseline scenario (continuation of the current practices of using coal/petroleum fuel) with the follow input parameters:

a) The energy consumption of coal is expected to increase from 55% to 90% of the total energy consumption in the pelletizing plants, through the coal powder injection facilities, based on the Coal Direct Injection Trial report /14/. This scenario was considered as the likely baseline regarding the lower price of coal compared with fuel oil (the anthracite price is 70% lower than fuel oil 7A on average);

b) Residual consumption of fuel oil equivalent to 10% of the energy demand in the furnaces of the pelletizing plants at the baseline;

c) The amount of natural gas consumed in the furnaces was calculated as equivalent of the energy fueled by the coal and fuel oil in the furnaces, and considering the efficiency of natural gas identical of coal and fuel oil. In addition, the NCV and carbon emission of coal, fuel oil and natural gas were considered as established on IPCC 2006.

d) The price of coal was verified through the FOB price of 4 last ships and respective transport, handling and mills /15/;

e) The price of fuel oil was verified trough the CIF notice price from Shell /20/ and ANP combustibles price reference /21/;

f) The price of natural gas was verified through the ASPE resolutions /23/;

g) The pellet production was considered the actual facilities capacity of 21.8 million t/y /12/;

h) The investment cost was verified according to CAPEX report /6/ which was supported by the follow documents:

   a. natural gas installation proposal /7/,

   b. natural gas control system proposal/8/,

c. natural gas burners proposal /9/

d. and natural gas pipeline proposal /10/;

i) The O&M was assessed trough the spreadsheet of O&M cost from Pellet facilitiy 1 and 2 with SAP figures from January 2007 to December 2008 /13/

j) The life time of project was considered 18 years according to the Samarco maintenance manager /24/

k) The depreciation was considered as 9%/year /33/ .

4.4.5 Investment analysis: Calculation and conclusion:

The investment comparison as NPV calculations were provided in a spreadsheet /5/ and verified by DNV. The result evidence that the baseline scenario has a NPV of (–R$ 3 115.66 million) and the project scenario has a NPV of (–R$ 3 696.57 million).

This could evidence the lower attractiveness of project activity compared with the continuation of baseline scenario.

4.4.6 Investment analysis: Sensitivity analysis:

Reasonable variations of the natural gas cost, coal and fuel oil cost, and investment were checked by calculating the variation necessary to reach the comparable cost of project activity and baseline and then discussing the likehood of that to happen.

The comparison is reached when:

- The natural gas price decrease 32.7% at the project activity price.
- Coal and fuel oil increase 33% at the baseline price
- The investment cost null (project activity NPV reach only 99% of baseline NPV)

Considering that the historic natural gas, coal and fuel oil price from November 2006 to November 2008 /20//23/ it could verified that the natural gas has a tendency to increase the price around 40% a year, the coal had increased around 24% a year and the fuel oil had increase around 8% a year. Considering the implementation cost variation, even it is considered zero, the NPV of the project activity will be reduced by only 1%, hence DNV is of the opinion that is deemed reasonable not considered for sensitivity analysis.

The project has the financial analysis considering the prices on the date of Samarco take the decision. In order to validate the actual scenario, DNV had verified that the price changed on 2009 as follow: natural gas + 6% /23/, Fuel oil + 2.6% /21/and coal equivalent of fuel oil + 2.6%. Considering these figures, the NPV comparison of project activity and the baseline is:

- Baseline = R$ - 3 160 million
- Project activity = R$ - 3 814 million

The above analysis demonstrates the financial model to be robust and that variations are not likely to compare the project activity with the baseline and that the project activity is financially not viable without the benefits from CDM.

4.4.7 Step *2 – Common practices analysis:*

The use of fuel and energy on pelletizing industry in Brazil had used significantly, coal, petroleum coke and fuel oil. The participation of natural gas, as verified by DNV on Brazilian "Energy National Balance" (pg 75) /27/, reach 7% at 2007 with respect to the total energy consumption compared with fuel oil as 30% and coal and coke as 35% at the same year.

In addition, DNV could verify the use of natural gas in pelletizing industry on Espírito Santo State, mainly by Vale facilities at Vitoria municipality /35/ are supplied through the existent natural gas pipeline from the natural gas field of north of Espírito Santo state. This pipeline is not connected with the south of state where Samarco is located. The present project will be connecting with the future natural gas pipeline (Cabiúnas - Vitória) that will be interconnected to GASBOL which bring natural gas from Bolivia /38/.

DNV had verified that the Bolivia has, at the present government, political instabilities and social conflicts that may lead to the interruption of the supply of natural gas to Brazil /36/. This instability has significant impact on the risk evaluation of projects which would use natural gas from GASBOL.

Hence the project activity is not considered as common practice into the pellet industry of south of Espírito Santo State.

Based on the above mentioned analysis and arguments, the project demonstrates that the most plausible scenario is the continuation of current prevailing practice (continuation of use of coal and fuel oil), and it is deemed appropriate that the emission reductions from this project is additional.

4.4.8 Step 3 – Impact of CDM registration:

As evidenced on financial analysis, the CDM registrations will reduce the negative NPV of project activity, the CDM registration will be an incentive to Samarco implement the project activity to reduce the CO2 emissions.

In conclusion, the assessment of the arguments presented above is deemed to sufficiently demonstrate that the project activity itself is not a likely scenario and that emission reductions resulting from the project are additional.

4.5 Monitoring

The project applies the approved consolidated monitoring ACM0009 (Version 3) – "Consolidated *baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas"* /41/.

4.5.1 Parameters determined ex-ante

According to ACM0009 Version 3, the baseline emissions are calculated *ex ante* considering the estimated coal or petroleum fuel consumed on baseline. In order to be conservative, the CERs were considered only from fuel oil equivalent consumption. The project emission was considered from the amount of equivalent natural gas consumed by the project activity. In addition, the leakage was considered as the upstream fugitive CH_4 emissions proportional of

equivalent natural gas consumed by the project activity less the upstream fugitive methane emissions from oil fuel, as established by the IPCC 2006 and table 2 of ACM0009 Version 3.

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

- Average net calorific value of the natural gas ($NCV_{NG,y}$) was considered as the supplier specifications (Petrobras Distribuidora) /22/;
- Net calorific value of fuel oil (NCV_{FF}) was considered according the figures established by the Brazilian "Energy National Balance" /27/
- CO_2 emission factor of natural gas ($EF_{NG,CO_2,y}$) and the CO_2 emission factor of fuel oil (EF_{FF,CO_2}) in absence of local or national data, was considered as IPCC default value;
- Emission factor for upstream fugitive methane emissions from production, transportation and distribution of natural gas ($EF_{NG,upstream,CH_4}$) was considered according to the applied methodology ACM0009/Version 3 Table 2;
- Emission factor for upstream fugitive methane emissions from production of the fuel type k. The values corresponding to RFO will be used. ($EF_{k,upstream,CH_4}$) was considered according applied methodology ACM0009/Version 3 Table 2 value;
- Energy efficiency of the pellet induration furnace of pelletizing plant 1, 2 and 3, respectively, in the baseline scenario:

  $$\varepsilon_{baseline,plant\_1} = 68.58\%,\ \varepsilon_{baseline,plant\_2} = 75.83\% \text{ and } \varepsilon_{baseline,plant\_3} = 73.24\%$$

  These efficiency calculations had considered the actual figures from June 2008 to November 2008 of fuel consumption, pellet production, properties of raw material, fuel and pellet, and loses of heat in furnaces /12/. The spreadsheet calculations were assessed and considered actual and verified to be applicable to cost control of Samarco, during the site visit.

4.5.2 Parameters monitored ex-post

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

- Quantity of natural gas combusted in the pellet induration furnace of pelletizing plants 1, 2 and 3, respectively, during the year y ($FF_{project,plant\_1,y}$, $FF_{project,plant\_2,y}$, $FF_{project,plant\_3,y}$ through respective thermal dispersion-type flow meter on each pellet plant;
- Monthly energy efficiency of the pellet induration furnace of pelletizing plant 1, 2 and 3, fueled with natural gas ($\varepsilon_{project,plant\_1}$, $\varepsilon_{project,plant\_2}$, $\varepsilon_{project,plant\_3}$) to be calculated as the same figures and spreadsheet of baseline efficiency calculation;

Management system and quality assurance

For the monitoring plan:

- The authority and responsibility of overall project management, as well as Procedures for maintenance of the monitoring equipments and installations are established as attributed

to the Samarco's Process Engineering Department according Certified Management Systems for Quality, Environment and Safety.

- Monitoring Report is attributed to MundusCarbo as responsible of monitoring methodology.

The data will be kept at least during the project lifetime.

The monitoring of sustainable indicators is not required by the methodology ACM0009.

4.6 Estimate of GHG Emissions

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

The baseline emissions (BE_y in tCO_2) will be calculated trough the equivalent amount of fuel oil, that would be combusted in the absence of the project activity in the pellet induration furnace of pelletizing plant 1, 2 and 3, during the year y in tones times the average net calorific value of fuel oil (MWh/tone) and times the CO_2 emission factor of fuel oil (tCO_2/MWh).

$$BE_y = \left(FF_{baseline,plant\_1,y} + FF_{baseline,plant\_2,y} + FF_{baseline,plant\_3,y}\right) NCV_{FF} \cdot EF_{FF,CO_2}$$

As the amount of fuel is equivalent of natural gas consumed by the project activity, the efficiency of baseline and project activity will be considered.

$$FF_{baseline,plant\_,y} = FF_{project,plant\_,y} \cdot \frac{NCV_{NG,y} \cdot \varepsilon_{project,plant\_,y}}{NCV_{FF} \cdot \varepsilon_{baseline,plant\_}}$$

The project emissions (PE_y in tCO_2) will be calculated trough the monitored amount of natural gas combusted by the project activity in the pellet induration furnace of pelletizing plant 1, 2 and 3, during the year y in tones times the average net calorific value of natural gas(MWh/tone) and times the CO_2 emission factor of natural gas (tCO_2/MWh).

$$PE_y = FF_{project,y} \cdot NCV_{NG,y} \cdot EF_{NG,CO_2,y}$$

The leakage emissions (LE_{CH4y} in tCO_2) will be calculated trough the monitored amount of natural gas combusted as MWh times the emission factor of upstream natural gas production less the equivalent amount of fuel oil in MWh times the emission factor of upstream of fuel oil.

$$LE_{CH_4,y} = [FF_{project,y} \cdot NCV_{NG,y} \cdot EF_{NG,upstream,CH_4} - \sum_k FF_{baseline,k,y} \cdot NCV_k \cdot EF_{k,upstream,CH_4}] \cdot GWP_{CH_4}$$

These emission factors are according IPCC 2006 and table 2 of ACM0009 (Version 3).

The PDD estimated amount of GHG emission reductions from the project is 157 881 tCO_2/year during the first credit period of 7 years crediting period which are clearly demonstrated on ex-ante calculation spreadsheet /4/.

4.7 Environmental Impacts

Samarco has been granted the Operation License LO 029/05 issued by the Environmental Agency of the Espírito Santo State (IEMA), which in his conditioning number 99 establish the regulation of fuel consumption. According the letter 3068/IEMA/GCA(ACGE) issued on 5 May 2009, the permit to switch coal and fuel oil by natural gas, requesting only the notice of the start date operation.

4.8 Comments by Local Stakeholders

Local stakeholders, such as the Municipal governments and City Councils, State and Federal 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 were evidenced by DNV. No negative comments were received. The Espírito Santo State's Prosecution has manifested positively.

4.9 Comments by Parties, Stakeholders and NGOs

The PDD of 16 January 2009 was made publicly available on DNV's climate change website /45/ and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 1 April 2009 to 30 April 2009. No comments were received.

VALIDATION REPORT

APPENDIX A

CDM VALIDATION PROTOCOL

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

Requirement	Reference	Conclusion
About Parties		
3.1.1. 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.
1. 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 A.2.
2. 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.
3. 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	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. 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	Decision 17/CP.7, CDM Modalities and Procedures Appendix B,	OK - The validation did not reveal any information that indicates that the project can be seen as a

Requirement	Reference	Conclusion
separate from and is not counted towards the financial obligations of these Parties.	§ 2	diversion of ODA funding towards Brazil.
5. 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.
6. 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.
7. 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.
8. 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		
9. 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	OK - Table 2, Section B.3.1
About forecast emission reductions and environmental impacts		
10. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	OK - Table 2, Section B.4 to B.7
For large-scale projects only		
11. 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	CDM Modalities and Procedures §37c	OK.- Table 2, Section D.

Requirement	Reference	Conclusion
required by the Host Party shall be carried out.		
About stakeholder involvement		
12. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	OK - Table 2, Section E.
13. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available.	CDM Modalities and Procedures §40	The PDD of 16 January 2009 was made publicly available on DNV's climate change website /45/ and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 01 April 2009 to 30 April 2009. No comments were received.
Other		
14. 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
15. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	OK.
16. 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.
17. 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 (03.2) of the CDM-PDD.
18. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP.	CDM Modalities and Procedures §37f	OK.

Table 2 Requirements Checklist

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A. General Description of Project Activity *The project design is assessed.*					
A.1. Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial boundaries (geographical) clearly defined?	/1//3/	DR	Yes. The project boundary correspond the Plant 1, 2 and 3 of pellet facilities, located at Ubu harbor, on Anchieta municipality, Espírito Santo State, Brazil at the address ES 060 Road, km 14.4 S/N, Ponta Ubú. The exact location of the project is defined using GPS coordinates 20º46'30"S/40º34'53"W. However as the project's system boundaries are restricted to the pellet facilities 1, 2 and 3 of Samarco facilities at Ubu harbor which will switch the coal and fuel oil used to endurance the pellets by natural gas; however the NG port (monitoring equipment for the NG at the plant battery limit) should be considered into the project boundary.	~~**CL 17**~~	OK
A.1.2. Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	/1//3/	DR	It is not clearly identified on PDD what are the duration and the quantity of NG contract and what is the NG supply failure rate in the Tubarão complex at Vitoria.	~~**CL 18**~~	OK
A.2. Participation Requirements *Referring to Part A, Annex 1 and 2 of the PDD as well as the CDM glossary with respect to the terms Party,*					

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
Letter of Approval, Authorization and Project Participant.					
A.2.1. Which Parties and project participants are participating in the project?	/1//3/	DR	The project participants are Samarco Mineração S/A of Brazil. The host Party Brazil meets all relevant participation requirements.		OK
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//3/	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.2.3. Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/1//3/	DR	Yes, Brazil fulfils all requirements. Brazil has ratified the Kyoto Protocol on 23 August 2002. The Brazilian designated national authority for the CDM is the Comissão Interministerial de Mudança Global do Clima		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//3/	DR	The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Brazil.		OK
A.3. Technology to be employed *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.*					

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.3.1. Does the project design engineering reflect current good practices?	/1//3/	DR	The project design engineering reflects good practice consisting partial switch from the mineral coal and fuel oil based energetic matrix to natural gas, a less carbon-intensive fuel, which consequent GHG emissions reductions		
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//3/	DR	Although as verified on Espírito Santo Energy Matrix of Mining and Pelletizing Industry, the participation of natural gas on total fossil fuel was 18.5% on 1990 and reach 21.8% on 2006 /34/, the project will use natural gas for 52% of energy demand. Hence, the use of natural gas for pellet production could be considered that is not commonly used technology.		OK
A.3.3. Does the project make provisions for meeting training and maintenance needs?	/1//3/	DR	Procedures for identification of training for the monitoring personnel and for maintenance of the monitoring equipments and installations will be established according the Management System for Quality, Environment and Safety of Samarco.		OK
A.4. Contribution to Sustainable Development *The project's contribution to sustainable development is assessed.*					
A.4.1. Has the host country confirmed that the project assists it in achieving sustainable development?	/1//3/	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	--	--

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			project assists it in achieving sustainable development.		
A.4.2. Will the project create other environmental or social benefits than GHG emission reductions?	/1//3/	DR	The project is expected to bring social benefits such as employment and training programmed of energy generation, thus contributing to the sustainable development objectives of the Brazilian Government.		OK
B. Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.2. Does the project apply an approved methodology and the correct version thereof?	/1//3/	DR	The project applies the approved consolidated baseline methodology ACM0009 (Version 3) – "Consolidated *baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas"*		OK
B.1.3. Are the applicability criteria in the baseline methodology all fulfilled?	/1//3/	DR	The project meets the applicability conditions of ACM0009 (Version 3) as i) Samarco had used coal and fuel oil to energy necessities of pellet production. The pipeline of natural gas is not available on Ubu facilities. The point of Petrobras natural gas pipeline could reach was Vitoria municipality, 50 km away /25/ /26/; ii) No regulation constrain the use of natural		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			gas. The energy Brazilian policy are carry on effort to improve the production and use of natural gas on national energy matrix /27/; iii) No regulation to require the use of natural gas or any other fossil fuel in the pellet production process element; iv) The use of natural gas on the induration pellet process will not increase the thermal capacity or lifetime of facilities. Pelletizing plants have an annual production capacity of iron ore pellets as 1 = 7.1Mton/y, 2 = 7.1 Mton/y and 3 = 7.6 Mton/y; v) the project will not integrated process. The three pellet facilities will be with the same production independent lines /20/.		
B.2. Baseline Scenario Determination *The choice of the baseline scenario will be validated with focus on whether the baseline is a likely scenario, and whether the methodology to define the baseline scenario has been followed in a complete and transparent manner.*					
B.2.1. What is the baseline scenario?	/1//3/	DR	Continuation of current practice of using coal and petroleum fuel oil		OK
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/1//3/	DR	• Switching from coal and fuel oil to biomass; • Project activity not undertaken under CDM; • Switching from coal and fuel oil to natural gas at a future point in the time of credit		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			period.		
B.2.3. Has the baseline scenario been determined according to the methodology?	/1//3/	DR	According the ACM0009 (Version 3), the baseline scenario, as the most plausible scenario has been selected and justified as follow: *Step 1*: Four scenarios were identified: e) Continuation of current practice of using coal and petroleum fuel oil; f) Switching from coal and fuel oil to biomass; g) Project activity not undertaken under CDM; h) Switching from coal and fuel oil to natural gas at a future point in the time of credit period. *Step 2:* Elimination the alternatives that are not compliant with applicable laws and regulations. As no regulation is applicable to restrict the change the fuel, no scenario was eliminated. *Step 3:* Elimination the alternatives that face prohibitive barriers: *Investment Barrier*: As verified the fuel price comparison, the average coal price is around US$13/Gcal /15/, the average fuel oil price is around US$55/Gcal /20/ and the natural gas price is around US$35/Gcal/23/, and the operation cost is significantly lower use the coal than natural gas. So only the		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			continuation or improve the use of coal was likely scenario. *Technological Barrier*: The scenario of use biomass to substitute the fossil fuel, has the regulation which don't permit use native biomass, and consequence, use eucalyptus or bagasse as biomass sources and burn on external burner of pellet facilities, once the biomass ash is not possible to incorporated into the pellet. This is not common practice in pellet industry as verified the null consumption of biomass to pellet production in Brazil /27/. *Prevailing Practice Barriers:* The production of natural gas used as fuel in Brazil has 2 main sources: a) Importation from Bolivia gas fields and transport by Petrobras pipe gas. b) Production on onshore and offshore Petrobras oil and gas fields. The transportation is also responsibility of Petrobras. Only distribution is responsibility of state gas company. As verified on market gas, the influence of Bolivian government /29/and the and the Brazilian Thermoelectricity Priority Program /28/, the prevailing practice of coal and oil fuel consumption has the lower supplying risk comparing with the project of switching to natural gas.		

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			Others Barriers: Considering the argumentation of prevailing practice and the restriction of use specific burner to use fuel oil, coal and natural gas, the change of fuel could not be on reversible condition, and if the was not implemented due the logistic risks, this condition could be the same during the credit period, and the project is not the likely scenario on the future. Considering the barrier analyses, the Continuation of the current practice of using coal and petroleum fuel is acceptable as the likely baseline scenario.		
B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/1//3/	DR	Yes, although the project aim switches partially coke and fuel oil, the baseline had considered all fuel as fuel oil which has lower emission factor.		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//3/	DR	The price of fuels is not evidenced into PDD	~~CL 7~~	OK
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1//3/	DR	Yes. See B.2.1		OK
B.2.7. Have the major risks to the baseline been identified?	/1//3/	DR	The use of natural gas in Espírito Santo's Mining and Pelletizing sector has started in the year 1983 in some units of the Tubarão Complex in Vitória, but it participation in the energetic matrix of this	~~CL 20~~	OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			sector has not gone through appreciable increases in the period comprising from 1990 to 2006. Needs to be stated to what % has the use of Natural gas usage has penetrated.		
B.3. Additionality Determination *The assessment of additionality will be validated with focus on whether the project itself is not a likely baseline scenario.*					
B.3.1. Is the project additionality assessed according to the methodology?	/1//3/	DR	In accordance with ACM0009 (Version 3), the additionality of the project is demonstrated through the *"Tool for the demonstration and assessment of additionality*		OK
B.3.2. Are all assumptions stated in a transparent and conservative manner?	/1//3/	DR	Assumptions were stated as the following steps: *Step 1 – Investment & sensitive analysis* **Input parameters:** The project activity (switch the coal and fuel boil by natural gas on pellet production) was compared with the baseline scenario (continuation of the current practices of using coal and petroleum fuel) with follow input parameters: a) Energy demand in the furnaces of the pelletizing plants was considered 80% from coal trough the powder injection facilities at the baseline. The option of powder injection is conservative, once the equipment is the option to the		

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			switching the fuel oil by coal; b) Residual consumption of fuel oil equivalent to 20% of the energy demand in the furnaces of the pelletizing plants at the baseline; c) The amount of natural gas consumed in the furnaces was calculated as equivalent the energy fueled by the coal and fuel oil in the furnaces, and considering the efficiency of natural gas identical of coal and fuel oil. This approach could be considered conservative, once the natural gas has more efficiency than coal and fuel oil. In addition, the NCV and carbon emission of coal, fuel oil and natural gas were considered as established on IPCC 2006. d) The price of coal was verified trough the FOB price of 4 last ships and respective transport, handling and mills /15/; e) The price of fuel oil was verified trough the CIF notice price from Shell /20/; f) The price of natural gas was verified trough the ASPE resolutions /23/;		

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			g) The discount rate of 9,05%/y was verified trough the WACC Samarco report /11/. The calculation consider : • 33% of third capital cost of 4.67%, corresponding **(Rf + Spread) * (1 – Tax)** where Rf (5.04%) is 30 years Nort America bonus, spread (0.65%) is the risk premium of Samarco loan and tax (18%) is the fiscal incentive. • 67% of own capital cost of 13,69% corresponding **Rf + Beta*(Rm – Rf) + Rb** where Rf (5.04%) is 30 years Nort America bonus, Beta (1.228) is the sector risk of Samarco, Rm (10.9%) is the premium risk of finance market, Rf (5.04%) is the free risk return and Rb (1.46%) is the Brazil risk /30//31//32/, however the applied WACC value as an internally approved value should be evidenced that has been used for other projects at Samarco; h) The pellet production was considered the actual facilities capacity of 21.8 Mton/y; i) The investment cost was verified	~~CL 12~~ ~~CAR 1~~	OK OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			according CAPEX report, however the tractability of the figures was not evidenced in order to support the total investment, as well as O&M costs, in addition the O&M cost in the excel worksheet is on the higher side and includes the entire plant (Plant O&M R$/TDM). Only the O&M of the project components should be considered..	~~CL 13~~ ~~CL 9~~	OK OK
			j) The time life of project was considered 18 years, a minimum period as the guidance /44/ and the depreciation was considered as 9%/year /33/ ; However the NPV calculation should take into account the residual value of the new equipment at the end of the lifetime of the project activity. In addition it was verified into spreadsheet that only the investment (capex and opex) have been considered in the NPV calculations, however, the savings of fuel avoidance have not been inbuilt per unit production and the difference should be built in to the NPV calculation. **Calculation and conclusion**: As the investment comparison were calculated for NPV consideration, the result evidence that the baseline scenario has a NPV of (–R$ 3 115.66 million) and the project scenario has a NPV of (–R$ 3 696.57 million). This could evidence the lower	~~CL 14~~	OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			attractiveness of project activity compared with the continuation of baseline scenario. **Sensitivity analysis:** A sensitivity analysis has been performed by decreasing and increasing in 5% and 10% with respect coal and fuel oil price and decreasing 5% and 10% with respect natural gas price. Considering that the average fuel price from November 2006 to November 2008 and the confidence interval of 95% the proportion of lower limits is 9.63% of average price of natural gas and 7.54% for coal and 7.44% for fuel oil, the sensitive analyses of 10% for electricity could be considered adequate. The scenario with -10% investment cost was analyzed. In all scenarios, the NPV of baseline activity are still lower than the project activity. *Step 2 – Common practices analysis:* As verified on Espírito Santo Energy Matrix of Mining and Pelletizing Industry, the participation of natural gas on total fossil fuel was 18.5% on 1990 and reach 21.8% on 2006 /34/, which is very lower compared with the foreseen component for Samarco project as 52% from natural gas. Hence the project activity is not considered as common practice into the pellet industry of Espírito Santo	~~CL 15~~	OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			State. *Step 3 – Impact of CDM registration:* As justified, the CDM registration will be an incentive to Samarco implement the project activity and reduce the CO2 emissions.. It also needs to be demonstrated on the following. Would the project have been implemented in the absence of CDM revenues once the NG is available? Like Tubarão complex has done. If they are able to operate without CDM revenues at 21% substitution, why cannot Samarco do it at 52% substitution without CDM revenues?		
B.3.3. Is sufficient evidence provided to support the relevance of the arguments made?	/1//3/	DR	The PDD and spreadsheet consider investment into baseline scenario, DNV request justify it.	~~CL 8~~	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//3/	DR	The starting date of the project activity is expected to May 2009 with respect Natural Gas Supply Contract between Samarco Mineração S/A and Petrobrás Distribuidora S/A as according EB 41 paragraph 67, however it is not evidenced yet. DNV request confirm it or postpone the starting project date for the date foreseen to start the change of fuel. The CDM consideration is not coming out clearly. That the PP was aware of CDM is established by the audit report and exploring of CDM projects. It needs to be demonstrated	~~CL 1~~	OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			that the audit report and the GHG inventory report mentions this project as one of the opportunities for a CDM project. It also needs to be demonstrated on the CDM consideration vide board notes etc as per the EB guidelines EB41 para 67). It also needs to be demonstrated on who the CDM revenues were decisive in the project implementation.		
B.4. Calculation of GHG Emission Reductions – Project emissions *It is assessed whether the project emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.4.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1//3/	DR	The project emissions (PE_y in tCO_2) will be calculated trough the monitored amount of natural gas combusted by the project activity in the pellet induration furnace of pelletizing plant 1, 2 and 3, during the year y in tones times the average net calorific value of natural gas(MWh/tone) and times the CO_2 emission factor of natural gas (tCO_2/MWh). $PE_y = FF_{project,y} \cdot NCV_{NG,y} \cdot EF_{NG,CO_2,y}$ The estimation project emission had considered the equivalent of natural gas calculated according amount of fuel oil and the NCV of fuel oil and NCV of natural gas		OK
B.4.2. Have conservative assumptions been used when calculating the project emissions?	/1//3/	DR	Yes, although the project aim switches partially coke and fuel oil, the baseline had	~~CL 16~~	OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			considered all fuel as fuel oil which has lower emission factor. However the figures of NCV fuels consider the IPCC values; however it is not justified if these are conservative considering the valued from ANP of Brazil.		
B.4.3. Are uncertainties in the project emission estimates properly addressed?	/1//3/	DR	It is not clearly justified into PDD how Mineral Coal (kg/TDM) is 0 in the project scenario	~~CL 10~~	OK
B.5. Calculation of GHG Emission Reductions – Baseline emissions *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.*					
B.5.1. Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1//3/	DR	The baseline emissions (BE_y in tCO_2) will be calculated trough the equivalent amount of fuel oil, that would be combusted in the absence of the project activity in the pellet induration furnace of pelletizing plant 1, 2 and 3, during the year y in tones times the average net calorific value of fuel oil (MWh/tone) and times the CO_2 emission factor of fuel oil (tCO_2/MWh). $BE_y = (FF_{baseline,plant\_1,y} + FF_{baseline,plant\_2,y} + FF_{bas}$ As the amount of fuel is equivalent of natural gas consumed by the project activity, the efficiency of baseline and project activity will be considered.		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			$FF_{baseline,plant\_,y} = FF_{project,plant\_,y} \cdot \frac{NCV_{NG,y} \cdot \varepsilon_{project,plant\_,y}}{NCV_{FF} \cdot \varepsilon_{baseline,plant\_}}$		
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1//3/	DR	Yes, although the project aim switches partially coke and fuel oil, the baseline had considered all fuel as fuel oil which has lower emission factor. However, although the estimation of CERs appears to e conservative considering the equivalent energy efficiency of furnaces with fuel oil and gas, for estimation purpose the manufacturers' specification should be used or it needs to be demonstrated that efficiency of the elemental process will not change due to fuel switch or that changes will be negligible (methodology).	~~CL 11~~	OK
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1//3/	DR	The baseline efficiency calculation were considering the actual figures from June 2008 to November 2008 of fuel consumption, pellet production, properties of raw material, fuel and pellet, and loses of heat in furnaces		OK
B.6. Calculation of GHG Emission Reductions – Leakage *It is assessed whether leakage emissions are stated according to the methodology and whether the argumentation for the choice of default factors and values – where applicable – is justified.*					
B.6.1. Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1//3/	DR	The leakage emissions (LE_{CH4y} in tCO_2) will be calculated trough the monitored amount of natural gas combusted, in MWh, times the emission factor of upstream natural gas		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			production less the equivalent amount of fuel oil, in MWh, times the emission factor of upstream of fuel oil.		
B.6.2. Have conservative assumptions been used when calculating the leakage emissions?	/1//3/	DR	These emission factors are according IPCC 2006 and table 2 of ACM0009 (Version 3).		OK
B.6.3. Are uncertainties in the leakage emission estimates properly addressed?	/1//3/	DR	See B.6.2.		OK
B.7. Emission Reductions *The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.*					
B.7.1. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/1//3/	DR	The project is expected to reduce 157 881 tCO_2e/year during the 7-year crediting period.		OK
B.8. Monitoring Methodology *It is assessed whether the project applies an appropriate monitoring methodology.*					
B.8.1. Is the monitoring plan documented according to the approved methodology and in a complete and transparent manner?	/1//3/	DR	The project applies the approved consolidated monitoring ACM0009 (Version 3) – "Consolidated *baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas"*		OK
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//3/	DR	The data will be kept at least during the crediting period.		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.9. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
B.9.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1//3/	DR	Yes, the main parameters will be the amount of natural gas consumed and the pellet facilities efficiencies.		OK
B.9.2. Are the choices of project GHG indicators reasonable and conservative?	/1//3/	DR	Are according ACM0009 (Version 3)		OK
B.9.3. Is the measurement method clearly stated for each GHG value to be monitored and deemed appropriate?	/1//3/	DR	Since it is stated that the project activity considers F.Oil as the backup fuel, this also may be included in the monitoring plan. In addition, considering the fact that mineral coal is less costlier that NG or FO, it is possible that the usage of mineral coal may increase or take preference over F.Oil. So that may also be monitored.	~~CL 19~~	OK
B.9.4. Is the measurement equipment described and deemed appropriate?	/1//3/	DR	The thermal dispersion-type flow meter for natural gas consumption will be installed according the best practice of natural gas supplier and national regulation (ABNT)		OK
B.9.5. Is the measurement accuracy addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1//3/	DR	The total natural gas consumption in the tree plants can be cross checked with the values read out of the farm tap's ultrasonic-type flow meter which will be used for computing the payment for the natural gas consumption.		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			Data will be electronically kept at least during the project lifetime.		
B.9.6. Is the measurement *interval* identified and deemed appropriate?	/1//3/	DR	This parameter will be continuously monitored.		OK
B.9.7. Is the *registration, monitoring, measurement* and *reporting* procedure defined?	/1//3/	DR	The responsibility for data collection and record keeping will be attributed to the Samarco's Process Engineering Department according the Management System for Quality, Environment and Safety implemented and certified at Samarco.		OK
B.9.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1//3/	DR	Quality control and quality assurance procedures will guarantee the quality of data collected. Periodic calibration procedures, if needed, will be performed according to specific guidance provided by the instruments' manufacturer. Project participants will keep record of the model, serial number and calibration procedures of the instruments employed in project monitoring during the project activity.		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//3/	DR	Collected data will be sent to MundusCarbo on a monthly basis and its crew will compile monitoring reports which will be presented during the project verification.		OK
B.10. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for*					

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
reliable and complete baseline emission data over time.					
B.10.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1//3/	DR	Beyond the natural gas amount monitoring (see B.9.1) the baseline will be calculated considering the monthly energy efficiency of the pellet induration furnace of pelletizing plant 1, 2 and 3, fueled with natural gas ($\varepsilon_{project,plant\_1}$, $\varepsilon_{project,plant\_2}$, $\varepsilon_{project,plant\_3}$) to be calculated as the same figures and spreadsheet of baseline efficiency calculation. /12/.		OK
B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/1//3/	DR	Are according ACM0009 (Version 3)		OK
B.10.3. Is the measurement method clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/1//3/	DR	The spreadsheet calculations were assessed and considered actual and verified to be applicable to cost control of Samarco, during the site visit		OK
B.10.4. Is the measurement *equipment* described and deemed appropriate?	/1//3/	DR	See B.9.4 and B.10.3		OK
B.10.5. Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1//3/	DR	See B.9.5 and B.10.3		OK
B.10.6. Is the measurement *interval* for baseline data identified and deemed appropriate?	/1//3/	DR	The natural gas consuming parameter will be continuously monitored. The efficiency is calculated monthly as cost control of Samarco.		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.10.7. Is the registration, *monitoring, measurement* and *reporting* procedure defined?	/1//3/	DR	See B.9.7		OK
B.10.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1//3/	DR	See B.9.8		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//3/	DR	See B.9.9		OK
B.11. Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
B.11.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1//3/	DR	The leakage is calculated considering the amount equivalent fuel oil in baseline and natural gas on project activity (See B.9.1 and B.10.1) and emission factor of upstream production of natural gas and fuel oil. These emission factors are according IPCC 2006 and table 2 of ACM0009 (Version 3).		OK
B.11.2. Are the choices of project leakage indicators reasonable and conservative?	/1//3/	DR	See B.9.1 and B.10.1		OK
B.11.3. Is the measurement method clearly stated for each leakage value to be monitored and deemed appropriate?	/1//3/	DR	See B.11.1		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
B.12.1. Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1//3/	DR	The monitoring of sustainable indicators is not required by the methodology ACM0009 version 3.		OK
B.12.2. Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1//3/	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//3/	DR	See B.12.1.		OK
B.13. Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
B.13.1. Is the authority and responsibility of overall project management clearly described?	/1//3/	DR	The responsibility for data collection and record keeping will be attributed to the Samarco's Process Engineering Department. Collected data will be sent to MundusCarbo on a monthly basis and its crew will compile monitoring reports which will be presented during the project verification.		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.13.2. Are procedures identified for training of monitoring personnel?	/1//3/	DR	Procedures for identification of training for the monitoring personnel will be addressed under the Management System for Quality, Environment and Safety implemented and certified at Samarco.		OK
B.13.3. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1//3/	DR	Not yet	~~CL 2~~	OK
B.13.4. Are procedures identified for review of reported results/data?	/1//3/	DR	Procedures for review of reported results/data and for corrective actions in order to provide more accurate future monitoring and reporting will be addressed under the Management System for Quality, Environment and Safety implemented and certified at Samarco.		OK
B.13.5. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1//3/	DR	See B.13.4.		OK
C. Duration of the Project/ Crediting Period *It is assessed whether the temporary boundaries of the project are clearly defined.*					
C.1.1. Are the project's starting date and operational lifetime clearly defined and evidenced?	/1//3/	DR	The starting date of the project activity is expected to May 2009 with respect Natural Gas Supply Contract between Samarco Mineração S/A and Petrobrás Distribuidora S/A as according EB 41 paragraph 67, however it is not evidenced yet. DNV request	~~CL 1~~	OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			confirm it or postpone the starting project date for the date foreseen to start the change of fuel		
C.1.2. Is the start of the crediting period clearly defined and reasonable?	/1//3/	DR	A renewable 7-year crediting period was selected, starting on 1 May 2010 or the date of registration whichever is later,		OK
D. Environmental Impacts *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.*					
D.1.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1//3/	DR	Samarco has been granted the Operation License LO 029/05 issued by the Environmental Agency of the Espírito Santo State (IEMA), which in his conditioning 99 establish the regulation of fuel consumption. According the letter 3068/IEMA/GCA(ACGE) issued on 05 May 2009, the permit to switch coal and fuel oil by natural gas, requesting only the notice of the start date operation.		OK
D.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1//3/	DR	See D.1.1		OK
D.1.3. Will the project create any adverse environmental effects?	/1//3/	DR	See D.1.1		OK
D.1.4. Are transboundary environmental impacts considered in the analysis?	/1//3/	DR	See D.1.1		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
D.1.5. Have identified environmental impacts been addressed in the project design?	/1//3/	DR	See D.1.1		OK
D.1.6. Does the project comply with environmental legislation in the host country?	/1//3/	DR	See D.1.1		OK
E. Stakeholder Comments *The validator should ensure that stakeholder comments have been invited with appropriate media and that due account has been taken of any comments received.*					
E.1.1. Have relevant stakeholders been consulted?	/1//3/	DR	Local stakeholders, such as the Municipal governments and City Councils, State and Federal 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 were evidenced by DNV. No negative comments were received.		OK
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1//3/	DR	See E.1.1		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//3/	DR	See E.1.1		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
E.1.4. Is a summary of the stakeholder comments received provided?	/1//3/	DR	No negative comments were received.		OK
E.1.5. Has due account been taken of any stakeholder comments received?	/1//3/	DR	No negative comments were received.		OK

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

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

A.5. Letter of approval					
A.1.1 Is the LoA received directly from the DNA or through the project participant.	/1//3/	DR	The LoA will be issued after the Brazilian DNA receive the preliminary validation report	--	
A.6. Project design					
A.2.1 Does the PDD describe the CDM project activity with all relevant elements in a transparent and accurate way?	/1//3/		Yes.		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//3/		The project has the validation started on 01 April 2009, before the starting date of the project activity is expected to be starting on August 2009. Hence the registration of project activity has only the timeline of validation project.		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//3/		Yes, the project is a large scale project activity. Yes, a site visit has been carried out on 08 April 2009		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//3/		The project activity involves the change of the gas burner of endurencing furnaces, described into PDD.		OK
A.7. 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//3/		Yes. All project emissions were considered and established an adequate monitoring plan		OK

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

A.8. Documentation of baseline emissions					
A.4.1 Documentation of the baseline determination: a. All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. b. All documentation is relevant as well as correctly quoted and interpreted. c. Assumptions and data can be deemed reasonable d. Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. e. The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/1//3/		Yes. Refer section B.2 of the validation table 2		OK
A.9. Documentation of the calculations					
A.5.1 Algorithms and/or formulae used to determine emission reductions • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced • All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity • The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.	/1//3/		Yes, refer section B.4, B.5, B.6 and B.7 of the validation table 2		OK
A.10. Implementation of the monitoring plan					

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

A.6.1 How were the plans for implementation of the monitoring plan, data management, QA/QC procedures assessed? To what extent can the emission reductions achieved by the project by monitored ex-post and verified later by a DOE?	/1//3/		Yes, the monitoring plan considers the measurement of fuel consumption. All document control is supported by the Quality Management System certified according ISO 9001;2000		OK
A.11. CDM consideration prior to starting date					
A.7.1 The prior consideration of CDM for the project activity complies with EB41 annex 46	/1//3/		The project has the validation started on 01 April 2009, before the starting date of the project activity is expected to be starting on August 2009. Hence the registration of project activity has only the timeline of validation project.		OK

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

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
CAR 1 The project investment cost was verified according CAPEX report, however the tractability of the figures was not evidenced in order to support the total investment, as well as O&M costs.	B.3.2	Evidences provided to DNV as requested.	The evidences of natural gas investment (/7//8//9//10/) and O&M cost demonstration (/13/) could evidence clearly the justification of financial analysis. Therefore this CAR is closed.
CL 1 The starting date of the project activity is expected to May 2009 with respect Natural Gas Supply Contract between Samarco Mineração S/A and Petrobrás Distribuidora S/A as according EB 41 paragraph 67, however it is not evidenced yet. DNV request confirm it or postpone the starting project date for the date foreseen to start the change of fuel	B.3.4	The (predicted) starting date has been postponed to August/2009, since the natural gas supply contract is still under negotiation. PDD has been updated.	The predicted starting date applied is according the guidance. Therefore this CL is closed.
CL 2 Procedure for emergency preparedness for cases where emergencies can cause unintended emissions was not identified.	B.13.3	Emergencies that can cause unintended emissions relate to accidental leakage of natural gas within Samarco's facilities. Such situations can promptly be detected by the operational staff by differences between in the natural gas flow rate measured in the entrance tap and in the plants' secondary tap and/or sudden system pressure losses. One of the functionalities of the entrance and secondary taps is shutting down the natural gas flow if necessary. Moreover, such taps comply with the standard ABNT NBR 12313 (01/09/2000) which accounts for "Controlling and safety for the utilization of combustible gases in low and high temperature processes".	The emergency procedures for natural leakage is according the safety for natural gas consumers (ABNT NBR 12313, ABNT NBR 15358) and is supported by the OHSAS management system of Samarco, Certified by DNV. Therefore this CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
CL 3 The PDD is not very clear in the project activity. At some places it is mentioned that the project activity is the switching of RFO with NG and at some places it mentions switching coal and RFO with NG. Needs to be made clear. The project scenario figure in the PDD also does not indicate coal.		Any sections of the PDD potentially leading to such confusion have been revised. Complementary clarifications are presented below. The proposed project activity consists in the partial switch from the mineral coal and RFO-based energetic matrix the pellet induration furnaces of Samarco's pelletizing plants to natural gas. In other words, the project activity consists in the inclusion of natural gas in the energy matrix of Samarco's pelletizing process. It is important to notice that the identified baseline scenario consists in the continuation with the energy matrix based on the consumption of coal and RFO. Yet, since coal is in average 80% less expensive than RFO (the history of RFO, coal and NG prices in the 2 years prior to the completion of the PDD has been provided for validation), an increase in the participation of coal within the energetic matrix is likely to be observed. In order to provide further evidence to that conclusion, we have presented three complementary routs through which the participation of coal could be increased (Direct injection of anthracite into the pellet induration furnaces, Increasing the quantity of coal added to the pellet feed and Coal combustion through an external solids burners) as well as the logistical feasibility of such increase. Furthermore, the historical structure of the energetic matrix in the Mining and Pelletizing sector, in Brazil and in Espírito Santo was presented, in which a consistent trend for the relative increase in the utilization of coal, especially visible in Espírito Santo, can be observed. Regarding the reviewer's statement "The project scenario figure in the PDD also does not indicate coal", please note	As evidenced by the energetic and cost characteristics, the baseline scenario would be the continuation of the current practice of using coal and petroleum fuel but increasing the percentage of coal, considering the same energy demand calculated according the IPCC and national EF and NCV. The project scenario consists in switching this amount of coal and fuel oil (RFO) by natural gas, also considering the energy calculations. The financial analyses evidence that the use of coal at intensive level has a NPV lower than the use of natural gas. Therefore this CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		that Table 7 (and financial analysis spreadsheet) distinguishes 'Coal in Pellet feed', whose consumption is assumed to be the same in the baseline scenario and in the project scenario for simplicity sake, and 'Coal in furnaces'. In the case of "Coal in furnaces", its consumption is assumed as non-existent in the project scenario. Instead natural gas will main source of energy in the pelletizing process (not accounting the energy from the coal in pellet feed). Moreover, as a conservative measure, we have assumed that 20% of the energy in the pelletizing process (not accounting the energy from the coal in pellet feed) will be supplied by RFO (backup).	
CL 4 The additionality is being substantiated by the NPV analysis, in which the following need to be justified. a. Capex to be verified for other cost (indicated in the excel worksheet. Also no installation costs are indicated. b. O&M cost is for the fill plant and should be for the project activity only. The Opex is > than the Capex in the project scenario. How is the 2.62 R$/TDM arrived at? c. The baseline NPV considers an investment and it is not clear for what. This is so because the trial have been conducted in 2007 for the direct injection of incremental (5.6%) coal.		a. Capex to be verified for other cost (indicated in the excel worksheet. Also no installation costs are indicated. CAPEX include all costs needed for the utilization of natural gas. Such cost were estimated by Samarco's engineering staff according to the project's 'basic plan' and to the costs depicted in a number of commercial quotations from equipment/material suppliers and service providers (provided to validation). The summarized CAPEX spreadsheet which was faithfully incorporated into the NPV analysis did not explicitly use the word 'installation'. The categorization of the CAPEX costs depicted in the PDD sought consistency between the categories presented in step 4 of ACM0009 and the nomenclature presented in the engineer's spreadsheet. Moreover, the R$ 16.228.866,37 cost under 'civil work' in the NPV analysis is referred as 'Civil work and electromechanical assembly' in the original summarized CAPEX spreadsheet. 'Other costs' include: "commissioning", "management", "owner cost", "spare parts" and "contingencies".	a. The spreadsheet Capex Gas v3, could detail the project activity investment. The figures were supported by the equipment, construction, piping and others evidences./5//13//7//8//9//10/.

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
d. The NPV calculation uses a WACC of 9.05%. To be confirmed that this is an approved internal benchmark used for other projects also. e. The NPV analysis does not take into account the savings incurred by the project activity. The cost of NG is lower that RFO, and the project activity reduces the quantity of coal consumption. So how does this affect the unit cost of production and the resulting savings? Need to be factored in to the NPV calculation.		b. O&M cost is for the fill plant and should be for the project activity only. The Opex is > than the Capex in the project scenario. How is the 2.62 R$/TDM arrived at? 'Pelletizing Plant' should not be confused with 'Induration furnace'. Samarco's 'Pelletizing Plants' besides their respective 'induration furnace' include a number of other complementary processes, such as iron ore pulp admission, pulp thickening, pulp filtering, 'roller press', addition of feedstock to the pellet feed, pelletizing (rotary tables), pellets stockyard and port. The 'induration furnaces' are being considered as the element process being subjected to fuel switch, hence O&M cost for the maintenance of the 'induration furnace' in the baseline scenario and in the project scenario is being considered in the NPV analysis. O&M costs were calculated based on total historical expenditures on personnel and maintenance of the 'induration furnaces' divided by the total production in the analysis period (2007-2008). "Opex is > than the Capex in the project scenario": Yes, that is correct. This is not only to the project scenario but to the baseline scenario as well. Fuel costs are strikingly high due to the energy intensity of the induration process, which results in the fact observed by the reviewer. c. The baseline NPV considers an investment and it is not clear for what. This is so because the trial have been conducted in 2007 for the direct injection of incremental (5.6%) coal. As mentioned elsewhere, the proposed project activity consists in the partial switch from the mineral coal and RFO-based energetic matrix the pellet induration furnaces of	b. The O&M was demonstrated through the Samarco SAP O&M SAP cost system reports indurance facilities 1 and 2 from Jan07 to Dec08 /13/. c. Although the O&M using coal request more maintenance than O&M using natural gas, the same O&M cost of baseline scenario (coal) was considered in project scenario (natural gas), as evidenced in spreadsheet Financial Analysis. d. The revised PDD could clarify that the SAMARCO has two options: the first continuing coal and fuel oil but investing to increase the coal proportion by direct injection (baseline) and the

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		Samarco's pelletizing plants to natural gas. Again, it is important to notice that the identified baseline scenario consists in the continuation with the energy matrix based on the consumption of coal and RFO although an increase in the participation of coal within the energetic matrix is likely to be observed. For the attainment of such increase, mainly due the routs of 'direct injection' of anthracite into the pellet induration furnaces or coal combustion through an external 'solids burner', adequacies in the induration furnace would be required and investments should be made accordingly. The investments considered in NPV calculation of the baseline scenario pertain to the installation of coal burners for the 'direct injection' rout. Values were based on the pilot-scale test performed in 2005 and were extrapolated to full scale. d. The NPV calculation uses a WACC of 9.05%. To be confirmed that this is an approved internal benchmark used for other projects also. This value is used for the purposes of evaluating other projects within Samarco, as it was made evident during site visit. For instance, the WACC calculation report provided to validation was handed from a member of the 'Projects Management' staff which is, *inter alia*, responsible for evaluating the feasibility of projects to be carried out by Samarco. e. The NPV analysis does not take into account the savings incurred by the project activity. The cost of NG is lower that RFO, and the project activity reduces the quantity of coal consumption. So how does this affect the unit cost of production and the resulting savings? Need to be factored in to the NPV calculation.	second was invest to switch to natural gas (project activity). The investment estimation on baseline could be evidenced by the Direct Injection Trial Pos Implementation Review (PIR) report /14/ adjusted to indurance facility The WACC report is a approved document of SAMARCO and had been used on previous projects as: a) #4 Pelletizing b) Electrostatic precipitator c) Access to Germano basic net d) Concentrator expansion for 1Mtpa.

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		Financial analysis compares the attractiveness of the fuel consumption structure of the identified baseline scenario and that predicted for the project scenario (PDD table 7). The financial attractiveness is assessed by means of NPV analysis, where the highest NPV defines the most attractive scenario. Hence, for the purposes of demonstrating the additionality of this project activity, NPV analysis was structured considering the costs associated with fuel purchase and other parameters specifically called for in ACM009. ACM009 notes that NPV values may be negative, and since the less negative NPV defined the most attractive scenario.	e. The reviewed PDD could clarify that the baseline scenario would be the use of coal in a intensive percentage. It could be evidenced that the amount of coal is considered according the energy demand of indurance facilities; the natural gas at the project activity is calculated at the same energy demand. Considering that it was demonstrated that the option to drive to the coal injection is the likely scenario. Considering the 5 additional information, the CL could be considered closed.
CL 5 Common practice analysis: it is stated that the energy matrix in the mining and pellatsing plant in the Espirito Santo region between (2000-06) indicates NG of 22%. The project activity is substitution of NG up to 52%. Since NG usage up to 22 % is a common practice, only the incremental increase from 22 to 52% can be claimed for CERs. Also data and numbers to be		Please note that the graphs indicated in figures 7 and 8 of the PDD depict the energetic matrix of the pelletizing **sector** in Brazil and in the Espírito Santo state, respectively. The figures **do not** represent the energetic matrix of a specific facility or company, whatsoever. This means that whereas some companies use natural gas in their processes, others do not. Unfortunately, the reports from which the information used for the compilation of figures 7 and 8 was obtained do not present the number of facilities, nor which facilities use or do not use natural gas. However, this information is not	As evidenced by the reviewed PDD and the justification, the Samarco plant is 55 km far from Vitória municipality, where it is installed the Vale harbour and Vale pelletizing facilities (Tubarão Complex) /35/, responsible by the numbers of natural gas use at Espirito Santo state and it is evidenced that the influence of this area over the Samarco site is minimum.

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
provided on the number of mining and pellatasing plant are in Brazil and the Espirat Santo region and how many use NG as energy source..		essential for the assessment of the main argument presented in the common practice analysis section: **"The use of natural gas in Espírito Santo's Mining and Pelletizing sector has started in the year 1983 in some units of the *Tubarão* Complex in Vitória, but it participation in the energetic matrix of this sector has *not* gone through appreciable increases in the period comprising from 1990 to 2006.** This steady-state consumption of natural gas is also evident when the countrywide data is analyzed". In other words, during 16 straight years, the participation of natural gas within the energetic matrix of the sector has not increased, both in Espírito Santo and in Brazil. One could also mention that circumstances in the 80's leading to the inclusion of this gas in certain facilities were different from those of the present situation. For instance, the Thermoelectricity Priority Program (Programa prioritário de termoeletricidade) was instituted in the year 2000, when the natural gas participation 'plateau' had been already reached, posing additional challenges for the utilization of natural gas in other facilities.	In addition, the existent natural gas supplying is from the natural gas field of north of Espírito Santo state, not connected with the south of state where Samarco is located. The present project will be connect with the natural gas pipeline which will serve Samarco's facilities (Cabiúnas - Vitória) that will be interconnected to GASBOL which bring natural gas from Bolivia. Therefore this CL is closed.
CL 6 The CDM consideration is not coming out clearly. That the PP was aware of CDM is established by the audit report and exploring of CDM projects. It needs to be demonstrated that the audit report and the GHG inventory report mentions this project as one of the opportunities for a CDM project. It also needs to be demonstrated on the CDM consideration vide board notes etc as per the EB guidelines EB41 para 67). Some questions		Regarding prior consideration of CDM, please note that as per **Annex 46/EB41** for "project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA and/or the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status". However, "such notification is not necessary if a PDD has been published for global stakeholder consultation or a new methodology proposed to the Executive Board before the project activity start date". Taking into account that "the starting date of a CDM project activity is the earliest date at which either the	As evidenced during the site visit, the project activity has not be starting at the moment of validation, and the CDM consideration could comply with Annex 46/EB41. Therefore this CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
are: a) when was the project identified; b) when was the project approved and what was the profitability/payback indicated in the note to management. It also needs to be demonstrated on how the CDM revenues were decisive in the project implementation.		implementation or construction or real action of a project activity begins" and that "the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity" and that "pre-project planning is not considered "real action"" (CDM-Glos-04, page 29), the most suitable milestone to be deemed as the project starting date of the present project activity is the date of signature of the natural gas supply contract. Considering that the signature of this contract has not yet taken place (predicted date: August/2009 – see CL01) and that the PDD was already published in the UNFCCC's website in April/2009, prior consideration of the CDM has been properly demonstrated according to the Board's guidance. Moreover, Annex 12/EB41 (Guidelines for completing the project design document (CDM-PDD) and the proposed new baseline and monitoring methodology) states that "**IF** the starting date of the project activity is before the date of validation, provide evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity". Only, "in **such cases**" (where the starting date of the project activity is before the date of validation) "project proponents shall provide an implementation timeline of the proposed CDM project activity". Hence, it is the PP's view that the reviewer's demands pertaining to the demonstration of prior consideration of CDM go beyond EB guidance. Even though, for clarity sake, more explanation on the project timeline presented in the PDD is given below. The presented timeline serves the main purpose of demonstrating that the validation was initiated **before** the	

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		project starting date. Additional information is provided in order to demonstrate Samarco's commitment to CDM along the pre-project arrangements. For instance the Audit Report referenced in the timeline lists possible measures (including the project activity) that would lead to GHG emission reductions and could be registered under the CDM. Furthermore, the report recommends "that a study of CDM be undertaken to determine practicalities for Samarco to sell Carbon Credits under this scheme". Following that recommendation, the compilation of the GHG inventory has been carried out. Besides indentifying measures that could lead to GHG emission reductions that could be potentially registered under the CDM, the study quantified such emission reductions and estimated potential CERs revenues. It is noteworthy that the current project activity is, again, clearly identified and assessed in the GHG inventory. "The evidence "that the project has been implemented in the absence of CDM revenues once the NG is available", has been addressed in the additionality section according to the steps outlined in ACM0009. Remaining points are addressed at the common practice analysis.	
CL 7 The price of fuels is not evidenced into PDD	B.2.5	As mentioned in the PDD, fuel prices (RFO and coal) are deemed as confidential by Samarco's staff. A spreadsheet containing a detailed history of fuel prices paid by Samarco (coal and RFO) and natural gas prices in Espírito Santo, as published by the Agency of Energy Public Services of the Espírito Santo State (Agência de Serviços Públicos de Energia do Estado do Espírito Santo - ASPE) has been provided to validation, along with all necessary supporting documentation (confidentiality has been request to DNV's team). Nonetheless, for clarity sake and for the purpose of	The evidences "Historic Prices – Confidential" and support evidences was assessed and are available on DNV office. All figures could be confirmed trough coal /19/, fuel receipts /20/ and NG prices according ASPE resolutions /23/ Therefore this CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		illustrating the historical fuel price structure, PP's have included Figure 6 in the PDD.	
CL 8 The PDD and spreadsheet consider investment into baseline scenario, DNV request justify it	B.3.3	As mentioned elsewhere, the proposed project activity consists in the partial switch from the mineral coal and RFO-based energetic matrix the pellet induration furnaces of Samarco's pelletizing plants to natural gas. Again, it is important to notice that the identified baseline scenario consists in the continuation with the energy matrix based on the consumption of coal and RFO although an increase in the participation of coal within the energetic matrix is likely to be observed. For the attainment of such increase, mainly due the routs of 'direct injection' of anthracite into the pellet induration furnaces or coal combustion through an external 'solids burner', adequacies in the induration furnace would be required and investments should be made accordingly. The investments considered in NPV calculation of the baseline scenario pertain to the installation of coal burners for the 'direct injection' rout. Values were based on the pilot-scale test performed in 2005 and were extrapolated to full scale.	According complementary justification, the likely baseline scenario would be enlarge the use of coal, as the price difference compared with fuel oil support the investment of process change. With this approach, the investment need to do it should be considered on baseline scenario. Therefore this CL is closed.
CL 9 The NPV calculation should take into account the residual value of the new equipment at the end of the lifetime of the project activity.	B.3.2	The fair-value of the equipments being installed under the project activity is being added back the financial analysis spreadsheet. A 10% constant yearly depreciation rate was applied for calculating the residual value of equipments as per guidance of the Federal Revenue Secretariat (references provided to validation).	The spreadsheet financial analysis SAMARCO v3 evidenced this consideration. Therefore this CL is closed
CL 10 It is not clearly justified into PDD how Mineral Coal (kg/TDM) is 0 in the project scenario	B.4.3	Please note that Table 7 (and financial analysis spreadsheet) distinguishes 'Coal in Pellet feed', whose consumption is assumed to be the same in the baseline scenario and in the project scenario for simplicity sake, and 'Coal in furnaces'. Only in the case of "Coal in furnaces", its consumption is assumed as non-existent in the project scenario. This is due	As evidenced by the reviewed PDD and the justification, it was clarified that the difference between the coal for pellet composition, and coal for heating the endurance furnace. Only this last is

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		to the fact that natural gas will main source of energy in the pelletizing process (not accounting the energy from the coal in pellet feed). Moreover, as a conservative measure, we have assumed that 20% of the energy in the pelletizing process (not accounting the energy from the coal in pellet feed) will be supplied by RFO (backup).	object of project. Therefore this CL is closed.
CL 11 Although the estimation of CERs appears to e conservative considering the equivalent energy efficiency of furnaces with fuel oil and gas, for estimation purpose the manufacturers' specification should be used or it needs to be demonstrated that efficiency of the elemental process will not change due to fuel switch or that changes will be negligible (methodology).	B.5.2	PP's apologize for any confusion caused. The statement that "energy efficiency for the processes fired with natural gas is higher to that situation in which coal and RFO are combusted" is not necessarily true. As stated, in the PDD "efficiency was/will be calculated as the ratio resulting of the subtraction of the total energy inputs minus thermal losses divided by total energy input. These parameters, in turn, were calculated according to the enthalpy of the chemical reactions taking place during the induration process (fuel oxidation, formation of $CaO.Fe_2O_3$, $2CaO.Fe_2O_3$ and $CaO.SiO_2$, oxidation of magnetite and oxidation of FeO from goethite, degradation of goethite and calcination of carbonates), the heating of the exhausted gases, the heating of the pellets and the vaporization of water. Such calculations are based on the monitored chemical composition and net calorific values of the fuels, on the chemical composition of the pellet-feed, raw pellets and indurated pellets and on the typical temperatures, flow rates and chemical composition of the exhausted gases. Other operational parameters, such as the average mass ratio between iron ore input and indurated pellet production (dry basis), the average mass ratio between raw pellets and indurated pellets, indurated pellet production, cool air intake and its moisture content are also taken into account". Hence efficiency is influenced by a plethora of other parameter not necessarily related to the oxidation efficiency of fuels (related to the statement that "energy efficiency for the	As evidenced by the reviewed PDD and the justification, it was clarified that the same endurance furnace efficiency fuelled with natural gas and with coal/RFO was considered only for baseline estimation, the actual efficiency will be considered into the monitoring plan. Therefore this CL is closed

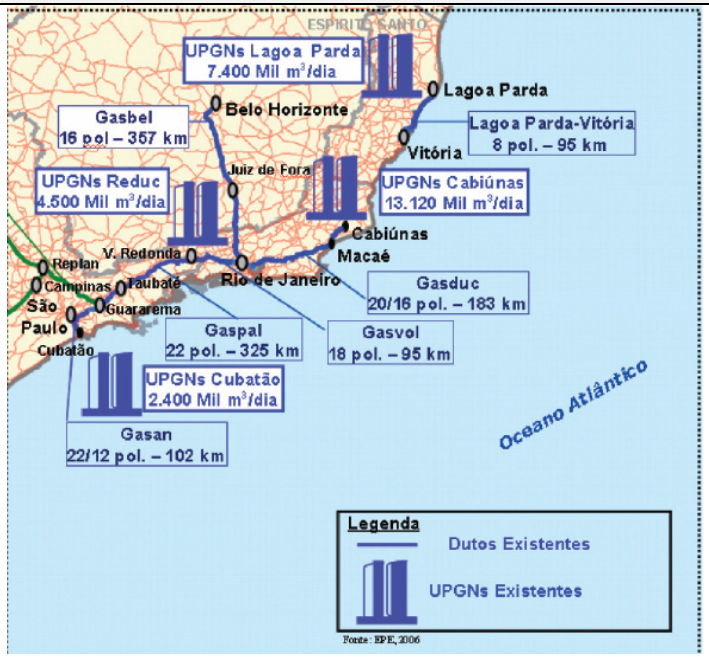
Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		processes fired with natural gas is higher to that situation in which coal and RFO are combusted"). For that reason, one could state that for the purposes of the **ex-ante calculation**, it is reasonable to assume that differences in the average energy efficiency in the baseline and project scenario are negligible, despite the fact that different fuels are involved. Please note that for the calculation of actual emission reduction efficiency will be **monitored ex post**. PDD has been revised.	
CL 12 The applied WACC value as an internally approved value should be evidenced that has been used for other projects at Samarco.	B.3.2	This value is used for the purposes of valuating other projects within Samarco, as was made evident during site visit. Moreover, the WACC calculation report provided to validation was handed from a member of the 'Projects Management' staff which is, *inter alia*, responsible for evaluating the feasibility of projects to be carried out by Samarco.	The WACC value is considered according actual figures used by SAMARCO on other previous projects as verified during the site visit. Therefore this CL is closed
CL 13 The O&M cost in the excel worksheet is on the higher side and includes the entire plant (Plant O&M R$/TDM). Only the O&M of the project components should be considered.	B.3.2	'Pelletizing Plant' should not be confused with 'Induration furnace'. Samarco's 'Pelletizing Plants' besides their respective 'induration furnace' include a number of other complementary processes, such as iron ore pulp admission, pulp thickening, pulp filtering, 'roller press', addition of feedstock to the pellet feed, pelletizing (rotary tables), pellets stockyard and port. The 'induration furnaces' are being considered as the element process being subjected to fuel switch, hence O&M cost for the maintenance of the 'induration furnace' in the baseline scenario and in the project scenario is being considered in the NPV analysis. O&M costs were calculated based on total historical expenditures on personnel and maintenance of the 'induration furnaces' divided by the total production in the analysis period (2006-2007). "Opex is > than the Capex in the project scenario": Yes, that	The spreadsheet Capex Gas v3, could detail the project activity investment. The figures were supported by the equipment, construction, piping and others evidences./5//13//7//8//9//10/ The complementary justification could evidence the conservativeness and approach. Therefore this CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		is correct. This is not only to the project scenario but to the baseline scenario as well. Fuel costs are strikingly high due to the energy intensity of the induration process, which results in the fact observed by the reviewer.	
CL 14 It was verified into spreadsheet that only the investment (capex and opex) have been considered in the NPV calculations, however, the savings of fuel avoidance have not been inbuilt per unit production and the difference should be built in to the NPV calculation.	B.3.2	Financial analysis compares the attractiveness of the fuel consumption structure of the identified baseline scenario and that predicted for the project scenario (PDD table 7). The financial attractiveness is assessed by means of NPV analysis, where the highest NPV defines the most attractive scenario. Hence, for the purposes of demonstrating the additionality of this project activity, **NPV analysis was structured considering the costs associated with fuel purchase and other parameters specifically called for in ACM009.** ACM009 notes that NPV values may be negative, and since the less negative NPV defined the most attractive scenario.	As evidenced by the reviewed PDD and the justification, it was clarified that the consideration of savings of fuel avoidance is included trough the investment comparison and the consumption of specific fuels could be evidenced in baseline scenario (coal/RFO) and project scenario (natural gas). Therefore this CL is closed
CL 15 While the statement in the PDD needs to be justified on the % of NG in the energy matrix, it also needs to be justified how the use of NG is not a common practice considering the fact that Tubarão complex is already doing this. Considering that the 21% is a common practice, the difference of 52% reach by Samarco from this common practice level should be considered for CERs.	B.3.2	Please note that the graphs indicated in figures 7 and 8 of the PDD depict the energetic matrix of the pelletizing **sector** in Brazil and in the Espírito Santo state, respectively. The figures **do not** represent the energetic matrix of a specific facility or company, whatsoever. This means that whereas some companies of the use natural gas in their processes, others do not. Unfortunately, the reports from which the information used for the compilation of figures 7 and 8 was obtained do not present the number of facilities, nor which facilities use or do not use natural gas. However, this information is not essential for the assessment of the main argument presented in the common practice analysis section: "The use of natural gas in Espírito Santo's Mining and Pelletizing sector has started in the year 1983 in some units of the *Tubarão* Complex in Vitória, but it participation in the energetic matrix of this sector has *not* gone through	As evidenced by the reviewed PDD and the justification, the Samarco plant is 55 km far from Vitória municipality, where it is installed the Vale harbour and Vale pelletizing facilities (Tubarão Complex) /35/, responsible by the numbers of natural gas use at Espírito Santo state and it is evidenced that the influence of this area over the Samarco site is minimum. Therefore this CL is closed

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		appreciable increases in the period comprising from 1990 to 2006". This steady-state consumption of natural gas is also evident when the countrywide data is analyzed". In other words, during 16 straight years, the participation of natural gas within the energetic matrix of the sector has not increased, both in Espírito Santo and in Brazil. One could also mention that circumstances in the 80's leading to the inclusion of this gas in certain facilities were different from those of the present situation. For instance, the Thermoelectricity Priority Program (Programa prioritário de termoeletricidade) was instituted in the year 2000, when the natural gas participation 'plateau' had been already reached, posing additional challenges for the utilization of natural gas in other facilities. For complementary facts, see answers to FUI 14.	
CL 16 The figures of NCV fuels consider the IPCC values; however it is not justified if these are conservative considering the valued from ANP of Brazil.	B.4.2	NCV from natural gas has been calculated according to parameters provided by BR Distribuidora S/A and ASPE as depicted in detail in the PDD's annex 1. NCV from RFO has been updated to a more conservative figure as depicted in: Balanço Energético Nacional 2007: Ano base 2006 (**National Energetic Balance 2007:** Base year 2006) Relatório final / Ministério de Minas e Energia. Empresa de Pesquisa Energética. Rio de Janeiro: EPE, 2007. 192 p.: 10 il. **New value: 9,590 kcal/kg = 11.15317 MWh/ton**. PDD and supporting documents (Historico_preços_CONFIDENCIAL, financial _analysis_SAMARCO and ex_ante_calculation) have been updated accordingly. Anthracite is imported and not available in Brazil. Hence, IPCC values are appropriate.	As evidenced by the reviewed PDD and the justification, the NCV for natural gas and for RFO were calculated according Brazilian Energy Balance Report (BEN) issued by Energy and Mine Ministry (http://www.mme.gov.br/mme/menu/todas_publicacoes.html). The coal anthracite is not available in Brazil and the NVC has still considered from IPCC. Therefore this CL is closed

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
CL 17 The project's system boundaries are restricted to the pellet facilities 1, 2 and 3 of Samarco facilities at Ubu harbor which will switch the coal and fuel oil used to endurance the pellets by natural gas; however the NG port (monitoring equipment for the NG at the plant battery limit) should be considered into the project boundary.	A.1.1	Agreed. The project boundary description in the PDD has been updated accordingly.	As evidenced by the reviewed PDD the system's boundary was considered from its delivery in the entrance tap till its site of combustion in the induration furnace. Therefore this CL is closed
CL 18 It is not clearly identified on PDD what are the duration and the quantity of NG contract and what is the NG supply failure rate in the Tubarão complex at Vitoria.	A.1.2	An important distinction must be made between the Tubarão Complex and Samarco. As depicted in the figure below, the natural gas pipeline serving Vitória, the city where the Tubarão Complex is located, was not connected to the GASBOL pipeline, which brings natural gas from Bolivia. Hence, Tubarão was not subjected to interruption risks due to political instabilities in that country by the time when it started utilizing this fuel. Differently, the natural gas pipeline which will serve Samarco's facilities (Cabiúnas - Vitória) will be interconnected to GASBOL. Considering that: 1 - the Decennial Energy Expansion Plan 2007/2016 (Plano decenal de expansão de energia: 2007/2016 - PDE) identifies future periods where the demand for natural gas may be higher than its supply and states that "in the next 10 years natural gas imports from Bolivia will sustain a considerable importance in the national scenario" 2 – Bolivia is the stage of political instabilities and social conflicts that may lead to the interruption of the supply of natural gas from that country. Please see the link below as an example episode of partial interruption in the natural gas supply from Bolivia as consequence of political instabilities	The complementary information and the reviewed PDD could evidence enough figures to support the baseline and project scenarios. Therefore this CL is closed

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		in that country. http://ultimosegundo.ig.com.br/economia/2008/09/11/explosao_forca_bolivianos_a_reduzir_envio_de_gas_para_o_brasil_1762971.html (Accessed in 16/01/2009). 3 - Brazilian Federal Government has created the Thermoelectricity Priority Program (TPP) in which the thermoelectric plants integrating the program, as defined by a subsequent regulation, would have guaranteed supply of natural gas during up to 20 years. 4 – The natural gas contract with BR Distribuidora is being negotiated under the 'interruptible' mode One can conclude that there is a strong possibility of non-steadiness of the natural gas supply, posing a barrier to the project activity.	

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		 **Existing natural gas pipelines in the southeastern region of Brazil in 2006**. From: Plano decenal de expansão de energia (*Decennial Energy Expansion Plan* - PDEE): 2007/2016 / Ministério de Minas e Energia ; Secretaria de Planejamento e Desenvolvimento Energético. _ Brasília : MME, 2007. 2 v. : il.	
CL 19 Since it is stated that the project activity considers F.Oil as the backup fuel, this also may be included in the monitoring plan. In addition, considering the fact that mineral coal is less costly that NG or FO, it is possible that the usage of mineral coal	B.9.3	Considering that the baseline emissions include carbon dioxide emissions from the combustion of the fuel that would be used in each induration furnace in the absence of the project activity to provide the energy obtained from the combustion of natural gas. In addition, the project activity emissions, carbon dioxide emissions from the combustion of natural gas in each induration furnace are included. Hence,	The clarification could evidenced that the use of fuel oil will reduce the amount of NG, which is considered to calculate the ER. Therefore this CL is closed

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
may increase or take preference over F.Oil. So that may also be monitored.		for the purposes of determining baseline and project emissions, the amount of natural gas will be monitored. If fuel oil and/or coal is consumed as backup fuel during the project activity one can state that these fuels would be consumed in the absence of the project activity, anyway, and do not imply in project emissions. In this situation, since the energetic demands would be supplied by these fuels, the consumption of NG would be reduced or inexistent hence the project would not receive credits as long as this situation would persist.	
CL 20 The use of natural gas in Espírito Santo's Mining and Pelletizing sector has started in the year 1983 in some units of the Tubarão Complex in Vitória, but it participation in the energetic matrix of this sector has not gone through appreciable increases in the period comprising from 1990 to 2006. Needs to be stated to what % has the use of Natural gas usage has penetrated.	B.2.7	As evidenced into figures 7 and 8, in the PDD, the relative participation (penetration) of natural gas in the energetic matrix of Brazil and Espírito Santo is presented, respectively. The reader could easily be informed of the penetration of natural gas in any given year within the analyzed timeframe. These figures are referenced wherever pertinent throughout the text. Moreover, the average penetration of natural gas in Espírito Santo during the period comprising 1990 to 2006 is 11.52%. During the same period, the fuels considered in the baseline had much larger penetration: RFO averaged 21.75% and Coal, 18.97%. Other relevant figures about NG penetration regard its evolution from decades 1990s to 2000s. Up to 2006, the penetration of NG in years 2000 averaged 12.89% whereas the average in the previous decade was 10.56%. However, data for the year 2001 is atypical, where consumption of RFO dropped from an average of 240 kTPE/year between 1991 and 2006, to 89 kTPE/year. When this year is not taken into account (due to possible improperly collected	The complementary evidences and the reviewed PDD could evidence the statement that the evolution of the use of natural gas at Espírito Santo State. Therefore this CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		RFO data) the penetration of NG in years 2000 corresponds to 11.94%. It is worth mentioning that the penetration of Coal has increased from 17.24% to 20.76% in the same period. Furthermore, the original table used for the compilation of graphs 7 and 8 are attached to the present document (energy_supply_pelletizing_sector.xls and energy_supply_pelletizing_sector_ES.xlsx).	

APPENDIX B

CERTIFICATES OF COMPETENCE

CERTIFICATE OF COMPETENCE

Luis Filipe Tavares

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

GHG Auditor:		Yes				
Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Expert***	***Methodology Expert***	***Technical Reviewer***
Landfill gas		Jan 2009	Jan 2009			
Renewables	*Hydro power*	Jan 2009	Jan 2009			
	Wind power		Sept 2009			
	Other renewable		Sept 2009			
Biomass		Mar 2009	Mar 2009			
Grid connection of isolated system			Sept 2009			
Cement						
Waste-heat / waste-gas recovery		Jan 2009		Nov 2009		
Efficiency of thermal power plants						
Coal mine methane						
Fuel switch		Jan 2010	Jan 2010	Nov 2009		
Manure management		Jan 2009	Jan 2009	Jan 2009		
Waste / wastewater treatment		Jan 2009	Jan 2009	Jan 2009		
Energy efficiency						
N_2O						
HFCs						
Flare reduction						
PFCs						
Charcoal			Sept 2009			
CO_2 recovery						
Transport						
Non-renewable biomass			Sept 2009			
Biofuel						
Pipeline leakage reduction						
SF_6						

Høvik, 12 January 2010

Michael Lehmann

Technical Director, Climate Change Services

Raman Venkata Kakaraparthi

CERTIFICATE OF COMPETENCE

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

GHG Auditor:		Yes				
Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Expert***	***Methodology Expert***	***Technical Reviewer***
Landfill gas		Jan 2009				
Renewables	*Hydro power*	Jan 2009	Sept 2009		Jan 2009	Jan 2009
	Wind power	Jan 2009	Jan 2009			
	Other renewable		Sept 2009			
Biomass		Jan 2009				Aug 2009
Grid connection of isolated system			Sept 2009			
Cement						Aug 2009
Waste-heat / waste-gas recovery		Jan 2009	Jan 2009	Jan 2009		Aug 2009
Efficiency of thermal power plants			Sept 2009	Jan 2009		Aug 2009
Coal mine methane						
Fuel switch			Sept 2009	Jan 2009		Aug 2009
Manure management						
Waste / wastewater treatment		Jan 2009				
Energy efficiency		Jan 2009	Jan 2009	Jan 2009		Aug 2009
N_2O			Sept 2009			
HFCs		Jan 2009	Jan 2009			Aug 2009
Flare reduction						
PFCs						
Charcoal						
CO_2 recovery			Sept 2009	Jan 2009		Aug 2009
Transport						
Non-renewable biomass						
Biofuel						
Pipeline leakage reduction						
SF_6						

Høvik, 1 September 2009

Michael Lehmann
Technical Director, Climate Change Services

Kumaraswamy Chandrashekara

CERTIFICATE OF COMPETENCE

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-8-1-CDMJI-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
Renewables	*Hydro power*	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	
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_2O		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

Michael Lehmann
Technical Director, Climate Change Services

CERTIFICATE OF COMPETENCE

Hendrik Brinks

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

GHG Auditor:	Yes				
Technical Area	***CDM Validator***	***CDM Verifier***	***Sector Expert***	***Methodology Expert***	***Technical Reviewer***
Landfill gas	Jan 2009			Jan 2009	Jan 2009
Renewables – *Hydro power*					
Renewables – *Wind power*				Jan 2009	Jan 2009
Renewables – *Other renewable*					
Biomass				Jan 2009	Jan 2009
Grid connection of isolated system					
Cement					
Waste-heat / waste-gas recovery				Jan 2009	Jan 2009
Efficiency of thermal power plants					
Coal mine methane				Jan 2009	Jan 2009
Fuel switch					
Manure management					
Waste / wastewater treatment				Jan 2009	Jan 2009
Energy efficiency				Jan 2009	Jan 2009
N_2O					
HFCs					
Flare reduction					Aug 2009
PFCs					
Charcoal					Aug 2009
CO_2 recovery					
Transport					Aug 2009
Non-renewable biomass					
Biofuel					
Pipeline leakage reduction					
SF_6					

Høvik, 24 August 2009

Michael Lehmann

Michael Lehmann
Technical Director, Climate Change Service