VALIDATION REPORT

"Petrobras FAFEN-BA Nitrous Oxide Abatement Project" in Brazil

REPORT NO. 2008-0433

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DET NORSKE VERITAS

VALIDATION REPORT

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CERTIFICATION AS

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Client: Petrobras	Client ref.: Elias Andrade Braga

Project Name: "Petrobras FAFEN-BA Nitrous Oxide Abatement Project"
Country: Brazil
Methodology: AM0034
Version: 03.1
GHG reducing Measure/Technology: "Catalytic reduction of N_2O inside the ammonia burner of nitric acid plants"
ER estimate: 401 562 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

In summary, it is DNV's opinion that the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project" in Brazil, as described in the PDD of 26 September 2008, meets all relevant UNFCCC requirements for the CDM and correctly applies the approved baseline and monitoring methodology AM0034, version 03.1. Hence, DNV requests the registration of the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project" as a CDM project activity.
Prior to the submission of the 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 by the DNA of Brazil that the project assists it in achieving sustainable development.

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Report title:
"Petrobras FAFEN-BA Nitrous Oxide Abatement Project" in Brazil

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Clean Development Mechanism

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Abbreviations

AMS	Automated Measuring System
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
N_2O	Nitrous oxide
NGO	Non-governmental Organisation
NPV	Net Present Value
ODA	Official Development Assistance
PDD	Project Design Document
UNC	Uncertainty of the monitoring system.
UNFCCC	United Nations Framework Convention on Climate Change

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1 EXECUTIVE SUMMARY – VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project" in Brazil. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism (CDM) and host Party criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

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

The project participant is Petrobras of Brazil. The host Party Brazil fulfils the participation criteria. No participating Annex I Party is yet identified. Prior to the submission of the 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 by the DNA of Brazil that the project assists it in achieving sustainable development. The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance (ODA) funding towards Brazil.

The project correctly applies AM0034, version 03.1: "Catalytic reduction of N2O inside the ammonia burner of nitric acid plants". By using the secondary N_2O abatement catalyst technology, which involves the installation of a secondary catalyst in the burner basket, N_2O will be converted into Nitrogen (N_2) and Oxygen (O_2) which have no adverse environmental or human health impacts. The project results in reductions of N_2O emissions that are real, measurable and give long-term benefits to the mitigation of climate change. It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be in average 57 366 tCO_2e per year over the first 7-year crediting period. The emission reduction forecast has been checked, and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

Adequate training, operating, maintenance and monitoring procedures will be formalised and put in place prior to the start of crediting period.

In summary, it is DNV's opinion that the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project" in Brazil as described in the PDD version 3 of 26 September 2008 meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria and correctly applies the baseline and monitoring methodology AM0034, version 03.1. DNV thus requests the registration of the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project" as a CDM project. Prior to the submission of the 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 by the DNA of Brazil that the project assists it in achieving sustainable development.

2 INTRODUCTION

Petrobras has commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project" at Camaçari nitric acid plant of *Fábrica de Fertilizantes Nitrogenados da Bahia* (FAFEN-BA) which is located in the municipality of Camaçari, Bahia State, Brazil. This validation report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures and the subsequent decisions by the CDM Executive Board.

2.1 Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AM0034 (Version 03.1) /11/. The validation team has, based on the recommendations in the Validation and Verification Manual /10/ employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

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

3 METHODOLOGY

The validation consisted of the following three phases:

I a desk review of the project design, the baseline and monitoring plan
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 assessed during the validation:

/1/ Petrobras: *Project Design Document for the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project"*. Version 3 of 26 September 2008.

/2/ Petrobras: *Project Design Document for the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project"*. Version 2 of 19 August 2008.

/3/ Petrobras: *Project Design Document for the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project"*. Version 1 of 18 February 2008.

/4/ Petrobras: Spreadsheet with Emission Reduction calculation (FAFEN_BA Emission Reduction Estimation.26 Sept2008 – final version.xls)

/5/ Petrobras: Spreadsheet with Financial Analysis calculation (Investment analysis-29092008-with and without CERs.xls)

/6/ Petrobras/FAFEN-BA:

Parecer sobre Cargas de Referência das Plantas de Ácido, date of 6 June 2008

Ratificação das Cargas de Referência da A100 e da A200 em 110 T/D, date of 4 June 2008

(Technical reports which explain historical increase in HNO3 production capacity at FAFEN-BA)

/7/ Centros de Estudos Ambientais (Environmental Agengy for Bahia State, Brazil):

- Environmental Operational License for FAFEN-BA date of 31 August 2005 (valid until 31 August 2009)
- Environmental Operational License for Camaçari Petrochemical Complex date of 15 February 2005 (valid until 15 February 2010)

/8/ Umicore Brasil Ltda:

10 Certificates of chemical analysis and controlling of Gauzes utilized at FAFEN-BA date of 19 August 2003, 13 August 2004, 12 November 2004, 5 May 2005, 12 August 2005, 18 April 2006, 31 August 2006, 5 February 2007, 18 December 2007 and 17 April 2008.

/9/ MGM International: *Assessoria na obtenção de créditos de carbono para projetos da Petrobras / Relatório de avaliação do potencial para obtenção de créditos de carbono*

em projetos indicados pela Petrobras (Carbon eligibility assessment for potential projects in Petrobras), April, 2006

/10/ International Emission Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. http://www.vvmanual.info

/11/ CDM-EB: *Approved Baseline and Monitoring Methodology AM0034 - "Catalytic reduction of N_2O inside the ammonia burner of nitric acid plants"*. Version 03.1.

/12/ CDM-EB: *Approved Baseline and Monitoring Methodology AM0034 - "Catalytic reduction of N_2O inside the ammonia burner of nitric acid plants"*. Version 02

/13/ CDM-EB: *Approved Baseline and Monitoring Methodology AM0028 - "Catalytic N_2O destruction in the tail gas of Nitric Acid or Caprolactam Production Plants"*. Version 04.1.

/14/ CDM EB: *Tool for the demonstration and assessment of additionality*. Version 5.02.

/15/ CDM EB: Glossary of CDM Terms

/16/ EU (2006). JRC. Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals-Ammonia, Acids and Fertilizers. Directorate- General Joint Research Centre (JRC), Institute for Prospective Technological Studies, European Commission, Seville, Spain. December 2006

Available for download at ftp://ftp.jrc.es/pub/eippcb/doc/lvic_bref_0907.pdf), P.123-125.

/17/ EAP (2006). Global Mitigation of Non-CO2 Greenhouse Gases. Report number EPA 430-R-06-005. United States Environmental Protection Agency Office of Atmospheric Programs (6207J). Washington, DC 20460. June 2006.

Available for download at http://www.epa.gov/nonco2/econinv/downloads/GlobalMitigationFullReport.pdf. P. IV6-IV8.

The data on the costs of N2O emission abatement in a Chinese nitric acid plant

Available for download at www.epa.gov/methane/excel/techtbls.xls.

/18/ Decomposition of N2O in the nitric acid industry, I. Melian-Cabrera, et al. Report number ECN-RX-05-080. Energy Research Centre of The Netherlands, Petten, The Netherlands

Available for download at http://www.ecn.nl/docs/library/report/2005/rx05080.pdf). P.21

/19/ Good Practice Guidance and Uncertainty Management in National Greenhouse Inventories by the International Panel on Climate Change (IPCC), 2000. P.3.35

Main changes between the version of the PDD version 1 of 18 February 2008 /3/ and PDD version 2 of and 19 August 2008 /2/ which were both published for the 30 days stakeholder commenting period and the final version (version 3) of the PDD /1/ which is submitted for registration:

- Approved Baseline and Monitoring Methodology AM0034 Version 03.1 is adopted in PDD version 2 and PDD version 3 while PDD version 1 adopted an earlier methodology version (AM0034 version 2);
- The PDD is revised according to the resolutions of raised CAR's and CL's;
- The expected start of project crediting period was changed due to changes in the project implementation schedule as a result of delays on deliveries of equipment and materials needed for the Automated Measuring System (AMS) installation. In addition, the campaign for baseline emission factor determination has been postponed, however it is expected to start after the project validation phase. Due to that the PDD was amended to consider the baseline campaign to be verified by the verifying DOE at project verification phase.
- The project starting date was changed to 23 November 2007 which is in line with Glossary of CDM Terms /15/.

3.2 Follow-up Interviews with Project Stakeholders

Date	Name	Organization	Topics
/20/	María Inés Hidalgo	MGM International	• Project background information. • Project technology, operation, maintenance and monitoring capability. • Project additionality. • Baseline determination.and emission reductions calculation. • Project monitoring and management plan. • Project environmental legal compliance • Campaign length historical data • Permitted operating ranges ammonia oxidation reactor (AOR) • Uncertainty of measurements • Stakeholder consultation process. • Training requirements and training provided by the equipment suppliers
/21/	Nuria Zanzottera	MGM International	
/22/	Elias Andrade Braga	Petrobras S.A,	
/23/	Nelson Alves	Petrobras S.A,	
/24/	Ricardo Costa	MGM International	
/25/	Carolina Tachibana	Petrobras S.A,	

3.3 Resolution of Outstanding Issues

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

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

The validation protocol consists of three tables. The different columns in these tables are described in the figure below. The completed validation protocol for the "Petrobras FAFEN-BA Nitrous Oxide Abatement 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.

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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 draft validation report including the initial validation findings underwent a technical review before being submitted to the project participants. The final validation report was subject to another technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation Team

Role/Qualification	Last Name	First Name	Country
Team leader/CDM validator	Leiroz	Andrea	Brazil
GHG Auditor	Ratton	Marco	Brazil
Sector expert	Kakaraparthi	Venkata Raman	India
Technical reviewer	Kopperud	Trine	Norway

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

4 VALIDATION FINDINGS

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

The validation findings relate to the project design as documented and described in the project design documentation of 26 September 2008.

4.1 Participation Requirements

The Project participant is Petrobras of Brazil. The host Party Brazil meets all relevant participation requirements. No participating Annex I Party is yet identified.

Prior to the submission of the 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 by the DNA of Brazil that the project assists it in achieving sustainable development.

4.2 Project Design

The purpose of the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project" is to reduce the current levels of N_2O emissions at the project developer's plant during the production of nitric acid (HNO_3). N_2O is generated as a by-product during the production of nitric acid and is released into the atmosphere in the absence of any regulations preventing this, and hence contributes to an increase of greenhouse gases in the atmosphere. The project consists of the installation of a secondary catalyst to abate N_2O inside the reactor once it is formed. The project is located at Camaçari nitric acid plant of *Fábrica de Fertilizantes Nitrogenados da Bahia* (FAFEN-BA) which is located in the municipality of Camaçari, Bahia State, Brazil and is operated by Petrobras S/A. The coordinates of the project are: 12 ° 41'52 "S latitude, 38 ° 19'26"W longitude. The nameplate capacity of the FAFEN-BA nitric acid plant is 110 ton 100% HNO_3 per day.

Nitrous oxide (N_2O) is an undesired by-product emitted from the production of nitric acid, which is formed during the catalytic oxidation of ammonia. As N_2O it self does not have any economic value or toxicity, it has been directly released into the atmosphere from nitric acid production plants without any treatment. The production process of nitric acid typically generates N_2O quantities of 2-19 kg per tonne of pure anhydrous nitric acid (100%) depending on the plant design /16/. Nitrous oxide is recognized as a potent greenhouse gas with a Global Warming Potential (GWP) of 310 compared to carbon dioxide (CO_2), and is responsible for approximately 6% of the greenhouse effect at present.

The project will use the secondary N_2O abatement catalyst technology which involves the installation of a new (not previously installed) catalyst below the oxidation gauzes (a "secondary catalyst") whose sole purpose is the decomposition of N_2O.

The process gas passes through the secondary catalyst and N_2O will be converted into nitrogen (N_2) and Oxygen (O_2) which have no adverse environmental or human health impacts.

The secondary abatement technology has been tested in several industrial trials in which it has been proven to be reliable in reducing N_2O and the technology is environmentally safe. Especially, its implementation does not lead to increase in NO_X emissions. Neither is the

environment directly or indirectly harmed in any other way. The selected technology has been developed by several catalyst suppliers. The secondary catalyst decomposes N_2O gases without affecting the nitric acid production either in efficiency or in quality. Typically the secondary catalyst has a very high activity and suppliers assure at least 80% of conversion efficiency. In the case of the project activity, FAFEN-BA will ensure that the chosen N_2O abatement catalyst vendor will take back the catalyst at the end of its useful life and refine, recycle or disposed of it, according to the prevailing EU standards.
Once installed, the catalyst itself and the Automated Measuring System (AMS) will be operated by the local FAFEN-BA employees. FAFEN-BA workers will be trained to reliably supervise the effective operation of the catalyst technology, apply the installed monitoring system to measure the emissions levels and collect the data in a manner that allows the successful completion of each verification procedure.

The necessary provisions related to maintenance are established in the monitoring plan. The start date of the project activity indicated in the PDD is 23 November 2007 which corresponds to the date when Petrobras signed the contract with ABB for the purchase of the AMS. The operational lifetime of the project is estimated to 25 years. A 7 years renewable crediting period is selected (with the potential of being renewed twice), and it is expected to start on 1 February 2009. The start of the crediting period is the latest date of either registration or the date of the completion of a baseline campaign, which is signed-off by the verifying DOE during the first periodic verification.

The project is expected to contribute to sustainable development objectives of the Brazilian Government focusing on industrial technology transfer and environmental impacts. In addition, the project activity will not cause job losses and will not impact on the local communities or access of services in the area. The project activity will not cause job losses at FAFEN-BA's plants. Furthermore, as declared in the PDD, Petrobras plans to invest part of the project revenues in programs aimed to educate the community in environmental matters.

The project does not involve public funding, 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 AM0034 (Version 03.1) - "Catalytic *reduction of N2O inside the ammonia burner of nitric acid plants"* /11/. This methodology is applicable to the project as this project consists of the installation of a dedicated decomposition device to convert the N_2O nitrogen and oxygen (O_2), and thereby preventing its release to the atmosphere. The project meets the methodology's applicability criteria:

- The plant has been installed prior to 31 December 2005: While the plant started its operation on 1982 with a nameplate capacity of 100 ton 100% HNO_3/day, that capacity was increased to 110 ton 100% HNO_3/day as result of improvements made before December 2005. DNV has received copies of technical reports which explain historical increase in HNO_3 production capacity at FAFEN-BA /6/.
- The project activity will not affect the level of nitric acid production at the existing facility;

- There are currently no regulatory requirements or incentives to reduce levels of N_2O emissions from nitric acid plants in Brazil;
- There is no existing N_2O destruction or abatement technology installed in the facility;
- The project activity will not cause any increase of NO_X emissions;
- There is no existing NO_X abatement catalyst system installed;
- The project activity will not lead to any new process emissions of greenhouse gases, directly or indirectly;
- Continuous measurements of N_2O concentration and total gas flow rate can be carried out in the exit of the process. The AMS will be installed prior to the installation of the secondary catalyst and monitoring will be carried out for one complete campaign in accordance with EN 14181:2004.

As referred in AM0034, the baseline scenario was identified using the procedure for the "*Identification of baseline scenario*" described in the approved methodology AM0028 (Version 04.1) - *"Catalytic N2O destruction in the tail gas of Nitric Acid or Caprolactam Production Plants"* /13/.

The methodology application first involves an identification of possible baseline scenarios, and eliminating those that would not qualify. The identified alternative scenarios are:

(i) current situation where there will be no installation of technology for destruction or abatement of N_2O

(ii) switch to alternative production method not involving ammonia oxidation process

(iii) alternative use of N_2O

(iv) installation of an N_2O destruction or abatement technology (secondary approach).

All provided alternatives are in compliance with the legal and regulatory requirements. As a result of application of all steps of the procedure to determine the baseline alternatives, it was demonstrated that the only feasible baseline alternative is the continuation of the status quo, which meets current regulations, and requires neither additional investments nor additional running costs. Therefore, the continuation of the current situation has been selected as the baseline scenario. The justifications and the references used for arriving at this decision are clearly stated in the revised PDD, they were checked by DNV and are deemed reasonable.

As required by AM0034, baseline emissions are calculated from an emission factor that is to to be measured before the implementation of the project activity (considering that it is physically very difficult to measure N_2O concentration upstream and downstream of the abatement system accurately). In the context of the "Petrobras FAFEN-BA Nitrous Oxide Abatement Project" the baseline will be determined by measuring N_2O baseline emission factor (kg N_2O/tonne HNO_3) during a complete production campaign, called "initial N_2O measurement campaign for baseline determination" which is yet to be initiated (expected start is October 2008).

Due to this, the PDD contains a typical value (IPPC value for same operating pressure as in FAFEN-BA nitric acid plant) only for the baseline emissions factor representing the average N_2O emissions per tonne of nitric acid. The results from the baseline campaign and thus the actual baseline emissions factor being used to determine baseline emissions will be subject to verification by the verifying DOE.

4.4 Additionality

In accordance with AM0034, the additionality of the project is demonstrated through the "*Tool for the demonstration and assessment of additionality*" (version 5.02) /14/ which includes the following steps:

Step 1 - Identification of alternatives to the project activity consistent with current laws and regulations: The possible scenarios are identified, i.e. i) current situation where there will be no installation of technology for destruction or abatement of N_2O, ii) switch to alternative production method not involving ammonia oxidation process, iii) alternative use of N_2O, iv) installation of an N_2O destruction or abatement technology (secondary approach).

The provided alternatives are in compliance with the legal and regulatory requirements.

As required by AM0034, the baseline scenario was identified using the procedure for "Identification of baseline scenario" described in the approved methodology AM0028 (Version 04.1) - *"Catalytic N2O destruction in the tail gas of Nitric Acid or Caprolactam Production Plants"* /13/. The selection of alternative scenarios was as described in section 4.3 of this report.

Step 2 - Investment analysis:

Sub-step 2a. Determine appropriate analysis method: As catalytic N_2O destruction facilities generate no financial or economical benefits other than CDM related income, a simple cost analysis is applied and which is deemed to be reasonable.

Sub-step 2b. – Apply simple cost analysis: The proposed CDM project activity is, without the revenues from the sale of certified emission reductions, less economically and financially attractive than the baseline scenario. The investment analysis provided shows that the only revenue arises from sales of CER's. The investment consists of the engineering, construction, shipping, installation and commissioning of the secondary catalyst and the measurement equipment. The operating and maintenance costs consist of the regular change of the catalyst as well as personnel costs for the supervision of the measurement equipment.

An investment analysis spreadsheet /5/ is enclosed to the PDD which sufficiently demonstrates that the project scenario requires a significant amount of investment and operating & maintenance costs for N_2O abatement catalyst technologies, which is not required for baseline scenario (the continuation of the current situation). The spreadsheet compares NPV values of the project with and without CER revenues. While in the absence of CER revenues (which are the only potential financial benefit for the project) the NPV is negative, the project becomes financially viable when CER revenues are considered: positive NPV of €1 352 591 for a discount rate of 9%). In conclusion, the proposed project activity, without the carbon revenue, is not financially attractive when compared with the baseline scenario.

Step 3 - Barrier analysis: A barrier analysis is not used for demonstrating additionality in this project.

Step 4 - Common practice analysis:

Sub-step 4a. Analyse other activities similar to the proposed activity: DNV was able to confirm that the proposed project activity is not common practice since no similar project at nitric acid plants are identified in Brazil. As currently, there are no national regulations or legal obligations in Brazil concerning N_2O emissions, the nitric acid industry typically releases into the atmosphere the N_2O generated as a by-product, as it does not have any

economic value or toxicity at typical emission levels. Thus, N_2O emissions in the stack gas can be considered the business-as-usual activity and it is spread all over the country. Furthermore, no nitric acid plant in Brazil has a secondary catalyst (or any other type of N_2O abatement technology) currently installed without incentive of the CDM.

Sub-step 4b Discuss any similar options that are occurring: No similar activities have been carried out in Brazil without the consideration of the CDM. As a conclusion, since similar project activities (not undertaken as CDM projects) are not observed the proposed project activity is not common practice.

Based on the assessment of a consultancy service report issued by MGM International for Petrobras and dated of April 2006 (Carbon eligibility assessment for potential project ideas at Petrobras' facilities), DNV was able to verify that CDM revenues were considered essential in the decision to invest in the project activity. The report identifies the reduction of N_2O emissions during the production of nitric acid at FAFEN-BA as one of potentially eligible CDM project activity at existent Petrobras facilities. The report also clearly states that reduction of N_2O emissions during the production of nitric acid at FAFEN-BA is a project idea and it is not a project previously approved by Petrobras or under an approval process. DNV highlights that, as other similar projects implemented in Brazil and other developing countries, the CDM economical benefit represents the main incentive and unique reason for the implementation projects providing catalytic reduction of N_2O inside the ammonia burner of nitric acid plants, which generates no financial or economical benefits other than CDM related income and which currently does not fulfil any national regulations or legal obligations in Brazil concerning N_2O emissions.

In conclusion, the project participants have sufficiently demonstrated that the proposed project is not a likely baseline scenario and thus the project is regarded additional.

4.5 Monitoring

The project applies the approved consolidated monitoring methodology AM0034 (Version 03.1) - *"Catalytic reduction of N2O inside the ammonia burner of nitric acid plants"*.

AM0034 requires the collection of N_2O baseline emissions data, the monitoring of ammonia and air input to the ammonia burner, as well as pressure and temperature inside the ammonia burner and the nitric acid produced during one production campaign of the nitric acid plant, prior to the installation of the N_2O abatement catalyst.

Furthermore, it requires the continued monitoring of the N_2O emissions after the installation of the N_2O abatement catalyst.

The Automated Measuring System (AMS), covered by the EN14181:2004 'Stationary Source Emissions', is applied to the N_2O analyser and the stack gas volume flow meter as demonstrated below:

– An automated extractive gas analyzer system that uses Non Dispersive Infrared Absorption (NDIR) (including probes, pipes and sample conditioning system) is installed, which will continuously measure the concentration of N_2O in the stack gas of the nitric acid plant. A probe extracts the homogenously mixed gas directly from the stack from the point at which it is pumped through gas lines to the analyzer, and

– A stack gas volume flow meter that uses differential pressure to continuously monitor the gas volume flow, temperature and pressure is installed in the stack of the nitric acid plant.

Three levels of quality assurance (QAL 1, QAL2 and QAL 3) as required by EN14181 is described in the PDD. The QAL 2 tests, including measurements with a standard reference method, will be performed and the results of the test will be verified by the verifying DOE.

Details of the data to be collected, the frequency of data recording, its certainty, and format are described. The format for data archiving seems appropriate for the project. All data will be kept until two years after the end of the crediting period.

Responsibilities and authorities for project management, monitoring and reporting project activities as well as for organising and training of the staff in the appropriate monitoring, measurement and reporting techniques and QA/QC procedures are clearly defined. The project will require additional training and project maintenance as described in the PDD.

4.5.1 Parameters determined ex-ante

According to the EB 31 Report, paragraph 28: "The Board clarified that either validating or verifying DOE could undertake the task of determination of the permitted operating conditions for project activities using approved methodology AM0034. The determination of the permitted operating conditions, if done at verification, should be as per the approved methodology." This decision was the endorsement of a recommendation by the Meth Panel (MP26 Report, paragraph 13): "*The Meth Panel, in response to the request by the Board, considered the role of the validating DOE and verifying DOE with respect to determination of permitted operating conditions according to AM0034. The Meth Panel was of the view that establishing a baseline through a campaign can be validated by a DOE. As this is conducted through monitoring, it therefore can also be undertaken by the verifying DOE. The Meth Panel recommended that either validating or verifying DOE could undertake the task of determination of the permitted operating conditions.*"

The project participants decided for this project that the monitoring of the baseline campaign shall be verified and signed off by the verifying DOE during the first periodic verification.

DNV has thus validated the permitted operating conditions and the correct implementation of the monitoring system for monitoring during the baseline campaign and the campaign after the installation of the N_2O abatement technology, but has not verified the data on the N_2O emissions during the baseline campaign.

The following parameters are made available *ex-ante*:

- OT_{normal}: Normal operating temperature – historical data for the previous five campaigns.
- OP_{normal}: Normal operating pressure – historical data for the previous five campaigns.
- AFR_{max}: maximum ammonia flow rate – historical data for the previous five campaigns.
- $AIFR_{max}$: maximum ammonia to air flow rate – historical data for the previous five campaigns.
- CL_{normal}: Normal campaign length – historical data for the previous five campaigns.
- GS_{normal}: Normal gauze supplier – historical data for the previous five campaigns (Umicore).

- GC_{normal}: Normal gauze composition –historical data for previous five campaigns

.

The permitted range for oxidation temperature was correctly calculated as 866 ºC- 894 ºC using historical data for the operating range of temperature and pressure from the previous five campaigns. The upper limits for ammonia flow and ammonia to air ratio into the ammonia oxidation reactor are correctly determined as 500 000 Pa – 520 000 Pa using historical data of ammonia flow rate and ammonia flow to air flow ratio from the previous five campaigns. DNV was able to verify that the permitted range is determined also through a statistical analysis of the historical data in which the time series data is interpreted as a sample for a stochastic variable. All data that falls within the upper and lower 2.5% percentiles of the sample distribution is defined as abnormal and are eliminated.

The maximum ammonia flow rate was defined as 1 384 kg NH3/hour while the ammonia to air flow rate to the ammonia oxidation reactor was defined as 0.0782 kg NH3/kg air. Both flow rate parameters were also calculated from historical process data.

Normal campaign length is defined as 11 990 ton 100% HNO3 which corresponds to the total number of metric tonnes of nitric acid at 100% concentration produced with one set of gauzes and was calculated from historical process data.

All historical data and its analysis were made available and assessed by DNV. The gauze supplier for the operation condition campaigns (the previous five campaigns) is Umicore which supplies primary catalyst package to FAFEN-BA on a contract basis. DNV was able to verify plant records on gauze information during the validation process, Name of the supplier is Umicore Brasil Ltda and gauzes compositions are Pt95%, Rh5% /8/.

Based on data information sourced from the catalyst supplier (section of supply contract for gauzes that specifies the technical characteristics agreed during baseline campaign), DNV was able to confirm that the composition of the ammonia oxidation catalyst used for the baseline campaign (not yet concluded) are identical to that used in the campaigns for setting the operating conditions.

4.5.2 Parameters monitored ex-post

The following parameters is determined *ex-post* as defined in the below table, these parameters are summarised in the PDD, Section B.7.1.

Section B.7.1 of the PDD is in line with the latest CDM-PDD Guideline. The monitoring equipment selected and the monitoring plan was validated to be appropriate.

Parameter	Frequency of monitoring	Observation
$NCSG_{BC}$ Mean concentration of N_2O in stack gas during the baseline campaign	Daily measured during a complete campaign before project implementation and continuously recorded every 2	Measured by NDIR, ABB AO-2000 Uras26. Calibration routine based on EN14181 is considered.

	seconds.	
VSG_{BC} Mean gas volume flow rate at stack in the baseline measurement period	Daily measured during a complete campaign before project implementation and continuously recorded every 2 seconds.	Measured by ANNUBAR flow meter. Calibration routine based on EN14181 is considered.
OH_{BC} Operating hours during the baseline campaign	Daily measured during a complete campaign before project implementation. Recorded daily.	Recorded by data logging system
NAP_{BC} Nitric acid production during the baseline campaign	Daily measured during a complete campaign before project implementation. Recorded daily	Measured by Coriolis mass flow meter. 100% nitric acid is calculated from the average of several concentration checkups performed in analytical laboratory. Cross checking of production measured by mass balance. Calibrated on a routinely basis according to the quality assurance system of the plant
TSG_{BC} Temperature of the flow gas at stack during the baseline campaign	Daily measured during a complete campaign before project implementation and continuously recorded every 2 seconds.	The ANNUBAR device for VSG measures the temperature and send the signal to the Data Acquisition System (DAS). Calibration routine based on EN14181 is considered.
PSG_{BC} Pressure of the flow gas at each stack during the baseline campaign	Daily measured during a complete campaign before project implementation and continuously recorded every 2	The ANNUBAR device for VSG measures pressure and send the signal to the Data Acquisition System (DAS). Calibration routine based on EN14181 is considered.

	seconds	
EF_{BL} Baseline emission factor	Calculated once after the baseline campaign based on measurements of the nitric acid production, stack gas flow rate, N_2O concentration, and the operating hours.	Calculated by the following equation. $EF_{BL} = (BE_{BC} / NAP_{BC}) / (1 - UNC/100)$ It is to be verified by the verifying DOE.
UNC Overall uncertainty of the monitoring system	Calculated (once after monitoring system is commissioned) as the combined uncertainty of the flow meter, the uncertainty of the N_2O concentration measurements, and the uncertainty of the nitric acid flow measurement, using the law of propagation of uncertainty.	Calculated from the specification of the measurement equipment. While QAL1 was supplied by the equipment manufacturer, for future calculations the uncertainty obtained from QAL2 test will be used. UNC has to be updated by QAL 2 test results and has to be verified by the verifying DOE.
AFR Ammonia gas flow rate to AOR	Monitored continuously.	Monitored by mass flow measuring device (orifice plate principle). Calibration routines according to the quality assurance system of the plant
AIFR Ammonia to air ratio of AOR	Calculated Recorded every hour.	Calculated from ammonia gas flow and air flow to AOR.
CL_{BL} Baseline campaign length	Calculated after the end of each campaign.	See NAP_{BC}
OT_h Oxidation temperature of ammonia oxidation reactor (AOR)	Every hour	Monitored by thermocouple in AOR. New thermocouples are installed on a routine basis (calibrated from the supplier).
OP_h Oxidation pressure of AOR	Every hour	Monitored by electronic pressure transducer located at the reactor's pipe inlet. Calibration routines according to the quality assurance system of the plant.
GS_{BL}	Once	Supplier's contract or invoice is

Gauze supplier for the baseline campaign		available for verification.
$GS_{project}$ Gauze supplier for the project campaign	Each project campaign	Supplier's contract or invoice is available for verification.
GC_{BL} Gauze composition for the baseline campaign	Once	Supplier's certificate of analysis or similar documentation is available for verification.
$GC_{project}$ Gauze composition for the project campaign	Each project campaign	Supplier's certificate of analysis or similar documentation is available for verification.
EF_{reg} Regulation on N_2O emissions in Uzbekistan	Occasional	Petrobras has a SMSNet system that verifies changes in the Brazilian Legislation
NCSG Mean concentration of N_2O in stack gas for the project campaign	Continuous Recorded every 2 second	Measured by NDIR, ABB AO-2000 Uras26. Calibration routine based on EN14181 is considered
VSG Mean stack gas volume flow rate for the project campaign	Continuous Recorded every 2 second	Measured by ANNUBAR flow meter. Calibration routine based on EN14181 is considered.
TSG Temperature of the flow gas at stack during the project campaign	Continuous Recorded every 2 second,	See TSG_{BC}
PSG Pressure of the flow gas at stack during the project campaign	Continuous Recorded every 2 second	See PSG_{BC}
PE_n Total N_2O emissions during the n^{th} project campaign	Calculated	To be calculated by equation: $PE_n = VSG * NCSG * 10^{-9} * OH$
OH Operating hours of AOR in the specific monitoring period	Daily measured during a complete campaign	Data Acquisition System will record plant effective operating hours
NAP_n Nitric acid production	Daily measured during a complete	See NAP_{BC}

during a specific project campaign	campaign	
EF_n Emission factor calculated for a specific project campaign	Calculated at the end of each project campaign	Calculated by equation: $EF_n = PE_n / NAP_n$
EF_{ma} Moving average emission factor of after n^{th} campaigns, including the current campaign	End of each project campaign	Calculated by equation: $EF_{ma} = (EF_1 + EF_2 + \ldots + EF_n) / n$ ($tN_2O/tHNO_3$)
CL_n Project campaign length	End of each project campaign	See NAP_{BC} To be used for cap of length of project campaign
EF_p Emissions factor to be applied to calculate the emissions reductions from the specific campaign	End of each project campaign	If $EF_{ma} \geq EF_n$ then $EF_p = EF_{ma}$ If $EF_{ma} < EF_n$ then $EF_p = EF_n$
EF_{min} Lowest EF_n observed during the first 10 project campaigns	End of each project campaign	Equal to the lowest EFn observed during the first 10 campaigns of the project crediting period (N2O/tHNO3)

4.5.3 Management system and quality assurance

Responsibilities and authorities for project management, monitoring and reporting project activities as well as the necessary provisions related to maintenance, measurement and reporting techniques and QA/QC procedures are clearly defined. Furthermore, before beginning the baseline campaign all the people involved in the operation and maintenance of the AMS will be trained to deal with the new technology installed. Those trainings will be developed according to Petrobras's Quality Management System, and registry of such trainings will be kept. FAFEN-BA nitric acid plant has procedures for emergency preparedness included into the Petrobras Quality Assurance System. All relevant instrumentation that measure process parameters will be calibrated according to Petrobras Quality Assurance System provisions.

4.6 Estimate of GHG Emissions

The project boundary comprises the physical, geographical site of FAFEN-BA nitric acid plant and equipment for the complete nitric acid production process from the inlet to the ammonia burner to the stack.

The project activity only comprises the GHG N_2O. No leakage calculations are required according to AM0034.

For the determination of the baseline emission factor, N_2O concentration and gas volume flow will be monitored throughout the baseline campaign yet to be concluded. Separate readings for N_2O concentration and gas flow volume for a defined period of time will be performed. Error readings and extreme values will be automatically eliminated from the output data series by the monitoring system. As measurement results can be distorted before and after periods of downtime or malfunction of the monitoring system (and can lead to maverick), a statistical evaluation will be applied to the complete data series of N_2O concentration as well as to the data series for gas volume flow in order to eliminate such extremes and to ensure a conservative approach.

For the *ex-ante* calculation of baseline emissions, project emissions and emission reductions the following assumptions and estimated values are used:

Parameter	Unit	Value	Definition
EF_{BL}	t N_2O /t HNO_3	0.00686	Baseline emission factor. Source: N_2O emission factor from IPCC (0.007 ton N_2O / ton HNO_3, according to the operating pressure of the plant), deducted by the uncertainty of the monitoring system.
OH_{BC}	hours	2 616	Number of operating hours during baseline campaign (obtained dividing the normal campaign length with the daily capacity of 110 ton 100% HNO_3/day and considering 24 operating hours per day.)
NAP_{BC}	tHNO_3	11 990	Nitric acid production during the baseline campaign.
UNC	*%*	2.01	Overall uncertainty of the monitoring system
$OH_{project}$	hours	3 240	Number of operating hours in the project campaign
$NAP_{project}$	tHNO_3 (100%)	14 850	Nitric acid production for the project campaign
NAP	tHNO_3/year	33 723	Nitric acid production during year *y*

The set overall uncertainty of the monitoring system was applied in the calculation of the estimated emission reductions as required by AM0034. The project emission factor, to be used for calculation of emission reduction during the crediting period, is estimated to 0.00137 tN_2O/t 100% HNO_3. DNV has received relevant evidences and documents related to the calculation of the emission reductions.

The baseline emission factor to be used for calculation of emission reduction during the crediting period shall be adjusted in accordance to the final data for the baseline campaign,

the results of the QAL 2 test (adjustments according to the calibration functions for N_2O analyser and stack gas flow), and the recommendations given to include a filter for excluding incorrect data (such as N_2O concentration values measured during zero and span calibration). The final baseline emission factor shall be verified as the first step of the verification by the DOE performing the verification of this CDM project.

A spreadsheet with emission reduction estimation calculation is enclosed to the PDD /4/.

The estimated amount of GHG emission reductions from the project is 401 562 tonnes CO_2 equivalents (tCO_2e) during the renewable 7 years crediting period, resulting in estimated average annual emission reductions of 57 366 tCO_2e.

4.7 Environmental Impacts

No significant negative environmental impacts are expected from the implementation of the project activity. Petrobras has been granted an Operational Licence issued by the Environmental Agency of the State of Bahia /7/. As stated in the national regulation, an environmental impact assessment is not required by Brazilian authorities for the project activity.

4.8 Comments by Local Stakeholders

Local stakeholders, such as the municipal government, the state and municipal agencies, the Brazilian forum of NGOs, the Municipal Chamber, the public ministry, the centre of industries and the workers syndicate, were invited to comment on the project, in accordance with the requirements of Resolution 1 of the Brazilian DNA which was the guidelines valid in November 2007 when the stakeholder consultation was conducted.

Two comments were received. One comment was positive and the other comment received suggested the use of other criteria of sustainability, such as using the Gold Standard PDD. This is not a valid comment as the PDD template used is as per the requirement of CDM. The project design did not require any significant modification.

DNV has received copies of letters sent to the local stakeholders and the comments received.

4.9 Comments by Parties, Stakeholders and NGOs

Both the PDD version 1 /3/ of 18 February 2008 and the PDD version 2 /2/ of 19 August 2008 were made publicly available on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 12 March 2008 to 10 April 2008 and 22 August 2008 to 20 September 2008 respectively. No comments were received.

APPENDIX A

CDM VALIDATION PROTOCOL

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

Requirement	Reference	Conclusion
About Parties		
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3.	Kyoto Protocol Art.12.2	Table 2, Section A.2.1 No participating Annex I Party is yet identified.
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	Table 2, Section A.2.
3. The project shall have the written approval of voluntary participation from the designated national authority of each Party involved.	Kyoto Protocol Art. 12.5a, CDM Modalities and Procedures §40a	Prior to the submission of the 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 by the DNA of Brazil that the project assists it in achieving sustainable development.
4. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof.	Kyoto Protocol Art. 12.2, CDM Modalities and Procedures §40a	Table 2, Section A.2 Prior to the submission of the 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 by the DNA of Brazil that the project assists it in achieving sustainable development.

Requirement	Reference	Conclusion
5. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Brazil.
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	The Brazilian designated national authority for the CDM is the Comissão Interministerial de Mudança Global do Clima.
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	Brazil has ratified the Kyoto Protocol on 23 August 2002.
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	No participating Annex I Party is yet identified.
9. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7.	CDM Modalities and Procedures §31b	No participating Annex I Party is yet identified.
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity.	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	Table 2, Section B.3.1
About forecast emission reductions and environmental impacts		
11. The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.	Kyoto Protocol Art. 12.5b	Table 2, Section B.4 to B.7
For large-scale projects only		

Requirement	Reference	Conclusion
12. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	CDM Modalities and Procedures §37c	Table 2, Section D.
About stakeholder involvement		
13. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received.	CDM Modalities and Procedures §37b	Table 2, Section E.
14. 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	Both the PDD version 1 /3/ of 18 February 2008 and the PDD version 2 /2/ of 19 August 2008 were made publicly available on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 12 March 2008 to 10 April 2008 and 22 August 2008 to 20 September 2008 respectively. No comments were received.
Other		
15. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	Table 2, Section B.1.1.
16. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances.	CDM Modalities and Procedures §45c,d	Table 2, Section B.2

Requirement	Reference	Conclusion
17. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	Table 2, Section B.2
18. The project design document shall be in conformance with the UNFCCC CDM-PDD format.	CDM Modalities and Procedures Appendix B, EB Decision	The project design document conforms to version 03.1 of the CDM-PDD.
19. 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/	DR	The project is at Camaçari nitric acid plant of Fábrica de Fertilizantes Nitrogenados da Bahia (FAFEN-BA) which is located in the municipality of Camaçari, Bahia State, Brazil. Section A.4.1.4 should contain more details of the project physical location. If possible, GPS coordinates are to be provided.	~~CL 1~~	OK
A.1.2. Are the project's system boundaries (components and facilities used to mitigate GHGs) clearly defined?	/1/	DR	The project boundary comprises the physical, geographical site of FAFEN-BA nitric acid plant and equipment for the complete nitric acid production process from the inlet to the ammonia burner to the stack.		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, Letter of Approval, Authorization and Project Participant.*					
A.2.1. Which Parties and project participants are participating in the project?	/1/	DR	The Project participant is Petrobras of Brazil. The host Party Brazil meets all relevant participation requirements. No participating Annex I Party is yet identified.		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
A.2.2. Have all involved Parties provided a valid and complete letter of approval and have all private/public project participants been authorized by an involved Party?	/1/	DR	Prior to the submission of the 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 by the DNA of Brazil that the project assists it in achieving sustainable development.		
A.2.3. Do all participating Parties fulfil the participation requirements as follows: - Ratification of the Kyoto Protocol - Voluntary participation - Designated a National Authority	/1/	DR	Yes, Brazil fulfils all requirements. • The Brazilian designated national authority for the CDM is the Comissão Interministerial de Mudança Global do Clima. • Brazil has ratified the Kyoto Protocol on 23 August 2002. • Prior to the submission of the 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 by the DNA of Brazil that the project assists it in achieving sustainable development.		OK
A.2.4. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance.	/1/	DR	The validation did not reveal any information that indicates that the project can be seen as a diversion of ODA funding towards Brazil.		OK
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*					

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
environmentally safe and sound technology and know-how is used.					
A.3.1. Does the project design engineering reflect current good practices?	/1/	DR	The project involves the installation of a secondary catalyst in the ammonia oxidation reactor in the nitric acid production process to abate nitrous oxide inside the reactor. The project does not involve any major changes with regard to the manufacturing technology and reflects current good practices.		OK
A.3.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	/1/	DR	This project activity uses a catalyst that has the property of decomposing N_2O. No information regarding the technology applied in the project, such as efficiency values and references were provided in the PDD.	~~CL 2~~	OK
A.3.3. Does the project make provisions for meeting training and maintenance needs?	/1/	DR	No procedures for training of monitoring personnel are mentioned in the monitoring plan. DNV requests further clarifications about the training.	~~CL 9~~	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/	DR	Prior to the submission of the 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 by the DNA of Brazil that the project assists it in		--

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			achieving sustainable development.		
A.4.2. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR	The project is expected to contribute to sustainable development objectives of the Brazilian Government focusing on industrial technology transfer and environmental impacts. In addition, the project activity will not cause job losses and will not impact on the local communities. Furthermore, as declared in the PDD, Petrobras plans to invest part of the project revenues in programs aimed to educate the community in environmental matters.		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.1.1. Does the project apply an approved methodology and the correct version thereof?	/1/	DR	The project applies the approved baseline methodology AM0034 *"Catalytic reduction of N_2O inside the ammonia burner of nitric acid plans"* and the steps for the identification of the baseline scenario of the approved methodology AM0028 *"Catalytic N2O destruction in the tail gas of Nitric Acid or Caprolactam Production Plants"*.		OK
B.1.2. Are the applicability criteria in the baseline	/1/	DR	Yes, the project fulfils the conditions under	~~CL 3~~	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
methodology all fulfilled?			which AM0034 is applicable. However, While the first applicability condition for the methodology AM0034 is not clearly justified, DNV requests the project participant to provide further substantiation on how such applicability condition is met		
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/	DR	Baseline scenario has been defined as the continuation of the current situation, where there will be no installation of technology for the destruction or abatement of N_2O.		OK
B.2.2. What other alternative scenarios have been considered and why is the selected scenario the most likely one?	/1/	DR	**Step 1a:** The baseline scenario alternatives should include all possible options that are technically feasible to handle N_2O emissions. The possible baseline scenarios are: • Continuation of *status quo*. The continuation of the current situation, where there will be no installation of technology for the destruction or abatement of N_2O. • Switch to alternative production method not involving ammonia oxidation process • Alternative use of N_2O, such as:		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			○ Recycling N_2O as a feedstock ○ Use of N_2O for external purposes • The installation of an N_2O destruction or abatement technology: ○ Primary approach ○ Secondary approach ○ Tertiary approach, including Non Selective Catalytic Reduction (or NSCR De NO_X) ○ Quaternary (or end of pipe) approach. The options include the CDM project activity not implemented as a CDM project. The only feasible baseline is the continuation of the *status quo*, which meets current regulations, and requires neither additional investments nor additional running costs.		
B.2.3. Has the baseline scenario been determined according to the methodology?	/1/	DR	As required by AM0034, the baseline scenario was identified using the procedure for the "*Identification of baseline scenario*" described in the approved methodology AM0028 (Version 04.1) - *"Catalytic N2O destruction in the tail gas of Nitric Acid or Caprolactam Production Plants"*. The methodology application first involves an identification of possible baseline scenarios, and eliminating those that would not qualify. It is demonstrated that the only feasible baseline is a continuation of the *status quo*, which meets current regulations,		OK

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

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			and requires neither additional investments nor additional running costs. Therefore, the continuation of the current situation can be selected as the baseline scenario.		
B.2.4. Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	Baseline scenario has been defined as the continuation of the current situation, where there will be no installation of technology for the destruction or abatement of N_2O in accordance with AM0028 as required by AM0034. The continuation of the current situation is selected as the baseline scenario. However, more info about the selection of secondary catalytic technology should be included in step 3 (Eliminate baseline alternatives that face prohibitive barriers) of section B.4 of the PDD.	~~CL 19~~	OK
B.2.5. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR	In Brazil there is currently no regulation that requires abatement of N_2O and the relevant air pollution control legislations pertain only to NO_x levels in stacks. Relevant documents related to environmental impact have not been provided to DNV. The following documents are therefore requested: • evidences that Petrobras already reported the implementation of the project activity to the Environmental Agency of the State of Bahia. • copy of the Operation Environmental	~~CL 17~~	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			License. measurements of NOx concentration in the stack gas of the nitric acid plant and evidence of the current legal emission level.		
B.2.6. Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	See B.2.2. All literature and sources are clearly referenced.		OK
B.2.7. Have the major risks to the baseline been identified?	/1/	DR	The methodology also takes into account the possible risk of changing regulation with proper adjustments to the baseline N_2O decomposition rates.		OK
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/	DR	In accordance with AM0034, 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/	DR	Yes		OK
B.3.3. Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	*Step 2 - Investment analysis:* *Sub-step 2a. Determine appropriate analysis method:* As catalytic N_2O destruction facilities generate no financial or economical benefits other than CDM related income, a		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			simple cost analysis is applied. *Sub-step 2b. – Apply simple cost analysis:* The proposed CDM project activity is, without the revenues from the sale of certified emission reductions, less economically and financially attractive than the baseline scenario. The investment analysis provided shows that the only revenue arises from sales of CER's. The investment consists of the engineering, construction, shipping, installation and commissioning of the secondary catalyst and the measurement equipment. The operating costs consist of the regular change of the catalyst as well as personnel costs for the supervision of the measurement equipment. DNV requests a copy of the investment analysis spreadsheet which has to be enclosed for the CDM registration. The investment analysis spreadsheet should also include an analysis including the income from CERs. In addition, evidence is to be provided for the assumed investment, operation and maintenance costs. *Step 3 - Barrier analysis:* A barrier analysis is not used for demonstrating additionality in this project. *Step 4 - Common practice analysis:* N_2O secondary abatement is not common practice in Brazil. Usually the nitric acid industry	~~CL 5~~	

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			releases into the atmosphere the N_2O generated as a by-product of the nitric acid production, as it does not have any economic value or toxicity at typical emission levels. Further details regarding the common practice should be provided in accordance with the requirements of step 4 of the additionality tool (i.e. similar project activities should be described and the differences between each of these activities and the project should be clearly indicated).	~~CL 6~~	
B.3.4. If the starting date of the project activity is before the date of validation, has sufficient evidence been provided that the incentive from the CDM was seriously considered in the decision to proceed with the project activity?	/1/	DR	The start date of the project activity indicated in the PDD is 23 November 2007 which corresponds to the date when Petrobras signed the contract with ABB for the purchase of the AMS.		OK
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/	DR	The ex-ante estimation of the project emission has been based on the following assumptions: the reduction in the N_2O in the tail gases will be 80% and a N_2O emission value given in IPCC 2006 for medium pressure combustion plants (7 kg N_2O/t NO_2).		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			An abatement efficiency of 80% was considered based on Johnson Matthey information, a catalyst supplier. DNV requests further explanations why Petrobras chose this supplier.	~~CL 14~~	
			The template of the table in section B.6.4 of the PDD is not in accordance with the "Guidelines for completing the project design document" version 06.2.	~~CL 13~~	
			A spreadsheet for the calculation of the emission reductions and CLnormal was not provided to confirm this estimate.	~~CL 16~~	
			As per AM0034 option (a), the permitted range for oxidation temperature and pressure is to be determined by historical data from previous five campaigns or fewer, if the plant has not been operating for five campaigns. The project developers are requested to explain why only four campaigns were used for normal operating temperature and pressure, whereas ammonia gas flow rates and ammonia to air ratio historical data from previous five campaigns were used. In addition, the normal campaign length should be defined as the average campaign length for the historic campaigns used to define the operating conditions (from the previous five	~~CL 20~~	

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			campaigns). The overall uncertainty should be included in section B.6.2 of the PDD. Emission reduction calculations are not correctly applied and transparently documented using the formulas established by AM0034. The overall uncertainty has not been correctly considered in the calculations of the emission reduction.	~~CL 21~~ ~~CL 22~~	
B.4.2. Have conservative assumptions been used when calculating the project emissions?	/1/	DR	See B.4.1.		OK
B.4.3. Are uncertainties in the project emission estimates properly addressed?	/1/	DR	See B.4.1.		OK
B.5. Calculation of GHG Emission Reductions – Baseline emissions *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/	DR	Emission reduction calculations are correctly applied and transparently documented using the formulas established by AM0034. A N_2O emission value given in IPCC 2006 for medium pressure combustion plants (7 kg N_2O/t NO_2) is applied for the baseline		OK

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			emission factor estimation. The template of the table in section B.6.4 of the PDD is not in accordance with the "Guidelines for completing the project design document" version 06.2. The baseline emission factor, to be used for calculation of emission reduction during the crediting period, will be established when the baseline campaign is finished. The final baseline emission factor for the plant shall be adjusted in accordance to the results of the entire baseline campaign length, the results of the QAL 2 test (adjustments according to the calibration functions for N_2O analyser and stack gas flow), and the recommendations given to include a filter for excluding incorrect data (such as N_2O concentration values measured during zero and span calibration). The final baseline emission factor shall be verified as the first step of the verification by the DOE performing the Verification of this CDM project. DNV requests the project participant to provide further clarifications regarding when the baseline campaign period is expected to be carried out. See B.4.1	~~CL 13~~ ~~CL 4~~ ~~CL 4~~	
B.5.2. Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	See B.5.1 and B.4.1.		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
B.5.3. Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	See B.5.1 and B.4.1.		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/	DR	As per AM0034, leakage is not to be considered.		OK
B.6.2. Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	See B.6.1.		OK
B.6.3. Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	See B.6.1.		OK
B.7. Emission Reductions *The emission reductions shall be real, measurable and give long-term benefits related to the mitigation of climate change.*					
B.7.1. Are the emission reductions real, measurable and give long-term benefits related to the mitigation of climate change.	/1/	DR	The project is expected to reduce CO_2 emissions to the extent of 401 562 tCO2e (57 366 tCO2e/year on average) during the first renewable 7 years crediting period. Relevant documents related to the calculation of the emission reductions have not been	~~CL 15~~	OK

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			provided to DNV. The following documents are therefore requested: • determination of the permitted operating conditions of the nitric acid plant (ammonia gas flow to the ammonia oxidation reactor, ammonia to air flow, oxidation temperature and oxidation pressure); • historical data and statistical analysis to determine the historic campaign length, CLnormal • nameplate of the nitric acid plant. A spreadsheet for the calculation of the emission reductions and CLnormal was not provided to confirm this estimate. The template of the table in section B.6.4 of the PDD is not in accordance with the "Guidelines for completing the project design document" version 06.2.	~~CL 16~~ ~~CL 12~~	
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/	DR	Yes, the approved monitoring methodology which is in conjunction with the baseline methodology AM0034 has been used.		OK
B.8.2. Will all monitored data required for verification and issuance be kept for two years after the end of	/1/	DR	Details of data to be collected and its certainty are described. However, data	~~CL 8~~	OK

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the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?			recording frequency and format and location are not clearly described. Also, the monitoring plan does not report for how long the data will be archived.		
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/	DR	Details of data to be collected and its certainty are described. However, data recording frequency and format and location are not clearly described. Also, the monitoring plan does not report for how long the data will be archived.	~~CL 8~~	OK
B.9.2. Are the choices of project GHG indicators reasonable and conservative?	/1/	DR	See B.9.1		OK
B.9.3. Is the measurement method clearly stated for each GHG value to be monitored and deemed appropriate?	/1/	DR	See B.9.1		OK
B.9.4. Is the measurement equipment described and deemed appropriate?	/1/	DR	The N_2O concentration will be measured by an infrared gas analyzer and the stack gas flow will be measured by an ANNUBAR device with automatically compensation for stack pressure and temperature. The nitric acid production is measured by using a mass flow meter (Coriolis principle). The characteristics of AMS should be stated	~~CL 7~~	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			in the PDD. In addition, DNV requests copies of the QAL 1 reports for the measurements of N2O concentration and stack gas volume flow.		
B.9.5. Is the measurement accuracy addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR	See B.9.1	~~CL 8~~	OK
B.9.6. Is the measurement *interval* identified and deemed appropriate?	/1/	DR	See B.9.1	~~CL 8~~	OK
B.9.7. Is the *registration, monitoring, measurement* and *reporting* procedure defined?	/1/	DR	The monitoring plan is straightforward and the established QA/QC procedures will be included in the quality management system.		OK
B.9.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	The procedures for maintenance of monitoring equipment and reporting are identified in the PDD. Maintenance and service logs will be kept at FAFEN-BA and made available for auditing purposes. For AMS, a QAL 3 according to EN14181, is described in the PDD and states that documented calibration procedure for weekly zero and span checks as well as resulting Shewart charts will be available on site for future verifications. In Annex 4, page 53 of the PDD, it is stated that "All relevant instrumentation to measure process parameters are calibrated on a routinely basis as per ISO system." DNV requests documented evidences of the ISO	~~CL 11~~	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			certified.		
B.9.9. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)	/1/	DR	Details of data to be collected and its certainty are described. However, data recording frequency and format and location are not clearly described. Also, the monitoring plan does not report for how long the data will be archived.	~~CL 8~~	OK
B.10. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for 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/	DR	In line with the methodology, the baseline emissions will be calculated from the concentration of N_2O monitored in the stack gas, the volume stack gas flow and the operating hours of the campaign. The baseline emission factor (t N_2O/ t HNO_3) is to be arrived from the parameters monitored during the baseline campaign, the GWP of N_2O, the operating hours and the nitric acid produced during the campaign. During the crediting period of the project the baseline emission factor is to be reassessed in case of change in the catalyst composition/changes in the regulations. Since Brazil does not have any regulation for the abatement of N_2O, the baseline emission factor will be used as such. The nitric acid production and the operating		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			hours will be monitored. The baseline campaign for the determination of the baseline emission factor was planned to start on May 2008 (however delayed and expected to start in October 2008) The permitted operating ranges for the ammonia oxidation temperature and pressure are determined from historical data. The spreadsheets including all baseline campaign data and baseline campaign length are to be presented for verification. All parameters measured during the baseline campaign will be archived in electronic and paper format during a minimum of 2 years or for the entire crediting period.		
B.10.2. Are the choices of baseline GHG indicators reasonable and conservative?	/1/	DR	N_2O is the only GHG indicator that needs to be accounted for in the baseline and it has been taken care of in the monitoring plan.		OK
B.10.3. Is the measurement method clearly stated for each baseline indicator to be monitored and also deemed appropriate?	/1/	DR	Yes, it will be possible to monitor the specified baseline indicators.		OK
B.10.4. Is the measurement *equipment* described and deemed appropriate?	/1/	DR	The N_2O concentration will be measured by an infrared gas analyzer and the stack gas flow will be measured by an ANNUBAR device with automatically compensation for stack pressure and temperature. The nitric acid production is measured by using a mass flow meter (Coriolis principle).		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			The characteristics of AMS should be stated in the PDD. In addition, DNV requests copies of the QAL 1 reports for the measurements of N2O concentration and stack gas volume flow.	~~CL 7~~	
B.10.5. Is the measurement *accuracy* addressed and deemed appropriate? Are procedures in place on how to deal with erroneous measurements?	/1/	DR	Yes. The monitoring procedures will be fully integrated into the Quality Management System.		OK
B.10.6. Is the measurement *interval* for baseline data identified and deemed appropriate?	/1/	DR	Yes. The baseline stack flow and N_2O concentration are measured during a complete campaign before project implementation and recorded every two seconds. The nitric acid production is measured daily.		OK
B.10.7. Is the registration*, monitoring, measurement* and *reporting* procedure defined?	/1/	DR	Yes. The monitoring plan is straightforward and the established QA/QC procedures will be included in the quality management system.		OK
B.10.8. Are procedures identified for *maintenance* of monitoring equipment and installations? Are the calibration intervals being observed?	/1/	DR	The procedures for maintenance of monitoring equipment and reporting are identified in the PDD. In Annex 4, page 53 of the PDD, it is stated that "All relevant instrumentation to measure process parameters are calibrated on a routinely basis as per ISO system." DNV requests documented evidences of the ISO certified.	~~CL 11~~	OK
B.10.9. Are procedures identified for day-to-day records	/1/	DR	Details of data to be collected and its	~~CL 8~~	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
handling (including what records to keep, storage area of records and how to process performance documentation)			certainty are described. However, data recording frequency and format and location are not clearly described. Also, the monitoring plan does not report for how long the data will be archived.		
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/	DR	As per AM0034, leakage is not to be considered.		OK
B.11.2. Are the choices of project leakage indicators reasonable and conservative?	/1/	DR	See B.11.1.		OK
B.11.3. Is the measurement method clearly stated for each leakage value to be monitored and deemed appropriate?	/1/	DR	See B.11.1.		OK
B.12. Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is assessed whether choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
B.12.1. Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR	The monitoring methodology AM0034 does not require the monitoring of social and environmental indicators. It is noteworthy that, as declared in the PDD, Petrobras plans to invest part of the project revenues in		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
			programs aimed to educate the community in environmental matters.		
B.12.2. Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	See B.12.1		OK
B.12.3. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR	See B.12.1		OK
B.13. Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
B.13.1. Is the authority and responsibility of overall project management clearly described?	/1/	DR	The authority and responsibility of the project management are clearly described. The plant manager will be responsible for the ongoing operation and maintenance of the N_2O monitoring system.		OK
B.13.2. Are procedures identified for training of monitoring personnel?	/1/	DR	The authority and responsibility for registration, monitoring, measurement and reporting are described.		OK
B.13.3. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR	Procedures for emergency preparedness for cases where emergencies can cause unintended emissions have not been addressed and need clarification.	~~CL 10~~	
B.13.4. Are procedures identified for review of reported	/1/	DR	Yes. The nitric acid plant process engineer		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl.	Final Concl.
results/data?			will be responsible to analyze data and assure appropriate and consistent procedural application during report preparation.		
B.13.5. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR	Yes.		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/	DR	The expected project starting date is 27 November 2007. The expected lifetime of the project is 25 years.		OK
C.1.2. Is the start of the crediting period clearly defined and reasonable?	/1/	DR	A renewable 7-year crediting period (with the potential of being renewed twice) was selected, starting on 1 February 2009 The start of the crediting period is the latest date of either registration or the date of the completion of a baseline campaign, which is signed-off by the verifying DOE during the first periodic verification.		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/	DR	Petrobas has been granted an Operational Licence issued by the Environmental Agency of the State of Bahia. As stated in the national regulation, an EIA is not necessary	~~CL 17~~	OK

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			for this activity. Relevant documents related to environmental impact have not been provided to DNV. The following documents are therefore requested: • evidences that Petrobras already reported the implementation of the project activity to the Environmental Agency of the State of Bahia. • copy of the Operation Environmental License. • measurements of NOx concentration in the stack gas of the nitric acid plant and evidence of the current legal emission level.		
D.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1/	DR	See D.1.1		OK
D.1.3. Will the project create any adverse environmental effects?	/1/	DR	The project will not affect the environment in any adverse way. The N_2O abatement catalyst vendor will take back the catalyst at the ends of its useful life and refine, recycle or disposed of it according to the prevailing EU standards.		OK
D.1.4. Are transboundary environmental impacts considered in the analysis?	/1/	DR	There are no transboundary environmental impacts.		OK
D.1.5. Have identified environmental impacts been addressed in the project design?	/1/	DR	The project does not have any adverse environment impact.		OK

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D.1.6. Does the project comply with environmental legislation in the host country?	/1/	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/	DR	Local stakeholders, such as the municipal government, the state and municipal agencies, the Brazilian forum of NGOs, the Municipal Chamber, the public ministry, the centre of industries and the workers syndicate, were invited to comment on the project, in accordance with the requirements of Resolution 1 of the Brazilian DNA. Two comments were received. One comment was positive and the other comment received suggested the use of other criteria of sustainability, such as using the Gold Standard PDD. This is not a valid comment as the PDD template used is as per the requirement of CDM. The project design did not require any significant modification. The letters sent to the local stakeholders and the comments received need to be evidenced.	~~CL 18~~	OK
E.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	See E.1.1		OK

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E.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR	See E.1.1		OK
E.1.4. Is a summary of the stakeholder comments received provided?	/1/	DR	See E.1.1		OK
E.1.5. Has due account been taken of any stakeholder comments received?	/1/	DR	See E.1.1		OK

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Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
CL 1 Section A.4.1.4 should contain more details of the project physical location. If possible, GPS coordinates are to be provided.	A.1.1	GPS coordinates have been included in section A.4.1.4 of the PDD.	OK. This CL is closed.
CL 2 No information regarding the technology applied in the project, such as efficiency values and references were provided in the PDD.	A.3.2	A paragraph giving more detail about the technology selected, including abatement efficiency has been added in section A.4.3 of the PDD.	OK. This CL is closed.
CL 3 While the first applicability condition for the methodology AM0034 is not clearly justified, DNV requests the project participant to provide further substantiation on how such applicability condition is met.	B.1.2	Justification on how FAFEN-BA fulfils the first applicability condition of AM0034 has been added in the PDD, including the design capacity of the plant and date of its installation. It was presented to DNV documents which explain how the plant increased its capacity since 1982 (date of plant installation) and shows that those improvements were made before December 2005. Documents mentioned above are: TP_005_2008_Parecer_Carga_Nítrico.pdf and TP_004_2008_Carga_Referência_Nítrico.pdf	OK. This CL is closed
CL 4	B.5.1	The starting month of the baseline	OK. This CL is closed. DNV highlights

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
DNV requests the project participant to provide further clarifications regarding when the baseline campaign period is expected to be carried out.	B.5.2 B.5.3	campaign has been modified in the PDD according to the latest schedule. AMS installation was delayed due to delay in deliveries of equipment and materials; then the starting date of the baseline campaign was moved from May 2008 to October 2008.	that due to changes in the project schedule, thus the establishment of the baseline emission factor through the baseline campaign is to be verified by the verifying DOE.
CL 5 DNV requests a copy of the investment analysis spreadsheet which has to be enclosed for the CDM registration. The investment analysis spreadsheet should also include an analysis including the income from CERs. In addition, evidence is to be provided for the assumed investment, operation and maintenance costs.	B.3.3	The investment analysis will be delivered to DNV taking account the recommendations done during the site visit.	OK. This CL is closed.
CL 6 Further details regarding the common practice should be provided in accordance with the requirements of step 4 of the additionality tool (i.e. similar project activities should be described and the differences between each of these activities and the project should be clearly indicated).	B.3.3	Similar project activities in the Host country have been mentioned in the PDD and it has been explained that those are developed also, under the framework of the CDM.	OK. This CL is closed.
CL 7 The characteristics of AMS should be stated in the PDD. In addition, DNV requests copies of the QAL 1 reports for the measurements of	B.9.4 B.10.4	QAL 1 information is provided. Further AMS at FAFEN-BA's plant will be installed during the following months, once the equipments are installed QAL2	OK. QAL1 relevant values were included in the PDD and related documentation was provided. This CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
N_2O concentration and stack gas volume flow.		test will be performed and the results of it will be kept at the plant for auditing purposes.	
CL 8 Details of data to be collected and its certainty are described. However, data recording frequency and format and location are not clearly described. Also, the monitoring plan does not report for how long the data will be archived.	B.8.2 B.9.1 B.9.2 B.9.3 B.9.5 B.9.6 B.9.9 B.10.9	The way in which the information will be archived has been added in the PDD.	OK. This CL is closed.
CL 9 No procedures for training of monitoring personnel are mentioned in the monitoring plan. DNV requests further clarifications about the training.	A.3.3	A paragraph explaining the issue of personnel training has been included in the Annex 4 of the PDD.	OK. This CL is closed.
CL 10 Procedures for emergency preparedness for cases where emergencies can cause unintended emissions have not been addressed and need clarification.	B.13.3	Procedures for emergency preparedness are included into Petrobras Quality Assurance System. We added a paragraph explaining these in Annex 4 of the PDD.	OK. This CL is closed.
CL 11 In Annex 4, page 53 of the PDD, it is stated that "All relevant instrumentation to measure process parameters are calibrated on a	B.9.8 B.10.8	The PDD states that all the relevant instrumentation that measure process parameter is calibrated according to Petrobras Quality Assurance System.	OK This CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
routinely basis as per ISO system." DNV requests documented evidences of the ISO certified.			
CL 12 The template of the table in section B.6.4 of the PDD is not in accordance with the "Guidelines for completing the project design document" version 06.2.	B.7.1	Table of section B.6.4 has been modified according the "Guidelines for completing the project design document" version 06.2.	OK This CL is closed.
CL 13 DNV requests further explanations regarding the choice of the IPCC value for the baseline emission factor.	B.4.1 B.4.2 B.4.3 B.5.1 B.5.2 B.5.3	Since the plant has not got values of monitored emissions at the plant site, it has been decided to use IPCC default emission factor according to reactor pressure. Since the plant is a medium pressure plant the number which corresponds is 0.007 ton N_2O/ ton HNO_3. The overall uncertainty was deducted from the default value in the emissions reduction estimation.	OK. This CL is closed.
CL 14 An abatement efficiency of 80% was considered based on Johnson Matthey information, a catalyst supplier. DNV requests further explanations why Petrobras chose this supplier.	B.4.1 B.4.2 B.4.3	Petrobras has not chosen the catalyst supplier for the project activity yet.	OK. This CL is closed.
CL 15 Relevant documents related to the calculation of the emission reductions have not been provided to DNV. The following documents	B.7.1	Historical data used to determine normal operating conditions and its calculations have been submitted to DNV during validation visit.	OK. This CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
are therefore requested: • determination of the permitted operating conditions of the nitric acid plant (ammonia gas flow to the ammonia oxidation reactor, ammonia to air flow, oxidation temperature and oxidation pressure); • historical data and statistical analysis to determine the historic campaign length, CL_{normal} • nameplate of the nitric acid plant.		Documents stating the nameplate capacity have been delivered to DNV during the validation visit	
CL 16 A spreadsheet for the calculation of the emission reductions and CL_{normal} was not provided to confirm this estimate.	B.4.1 B.7.1	Normal campaign length calculation was delivered to DNV during the validation visit.	OK. This CL is closed.
CL 17 Relevant documents related to environmental impact have not been provided to DNV. The following documents are therefore requested: • evidences that Petrobras already reported the implementation of the project activity to the Environmental Agency of the State of Bahia. • copy of the Operation Environmental License. • measurements of NOx concentration	B.2.5 D.1.1 D.1.2 D.1.6	Copies of Operational License of the plant and the site have been sent to DNV after the validation visit.	OK. This CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
in the stack gas of the nitric acid plant and evidence of the current legal emission level.			
CL 18 The letters sent to the local stakeholders and the comments received need to be evidenced.	E.1.1 E.1.2 E.1.3 E.1.4 E.1.5	Evidences of the consultation process have been shown to DNV during the validation visit.	OK. This CL is closed.
CL 19 The continuation of the current situation is selected as the baseline scenario. However, more info about the selection of secondary catalytic technology should be included in step 3 (Eliminate baseline alternatives that face prohibitive barriers) of section B.4 of the PDD.	B.2.4	The selection of the secondary catalytic technology has been modified in the PDD in order to describe it with more detail.	OK. This CL is closed
CL 20 As per AM0034 option (a), the permitted range for oxidation temperature and pressure is to be determined by historical data from previous five campaigns or fewer, if the plant has not been operating for five campaigns. The project developers are requested to explain why only four campaigns were used for normal operating temperature and pressure, whereas ammonia gas flow rates and ammonia to air ratio historical data from	B.4.1	Normal oxidation pressure, normal oxidation temperature, maximum ammonia gas flow rate and maximum ammonia to air ratio are determined using historical data. According to the methodology the previous five campaigns to the baseline campaign shall be used to determine normal operating conditions if option a) (historical data) is selected for determining them. By the moment of	OK. PDD was amended accordingly. This CL is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
previous five campaigns were used. In addition, the normal campaign length should be defined as the average campaign length for the historic campaigns used to define the operating conditions (from the previous five campaigns).		submitting the PDD only four historical campaigns were available and the fifth campaign was running, then four campaigns were used in the previous analysis. By the moment of the validation visit, the fifth campaign was over and values stated in the PDD have been obtained using five historical campaigns.	
CL 21 The overall uncertainty should be included in section B.6.2 of the PDD.	B.4.1	The UNC details are included in section B.7.1- Data and parameters monitored. As the QAL2 tests have not been performed yet, only an estimated value of UNC can be stated in the PDD now.	OK. The estimeated value for overall uncertainty was included in Section B.7.1. of the PDD However the final value of the UNC will be verified by the verifying DOE after the results of QAL 2 is made available.
CL 22 Emission reduction calculations are not correctly applied and transparently documented using the formulas established by AM0034. The overall uncertainty has not been correctly considered in the calculations of the emission reduction	B.4.1	Since neither the QAL1 nor the QAL2 test have been performed yet, no UNC value is available at the moment and therefore, it can not be added in the emission reduction estimations. Once QAL1 information is received emission reduction estimations will be updated including the value of UNC.	OK. Emission reduction estimations were updated in the PDD including an estimated % value for the overall measurement uncertainty of the monitoring system (UNC). Documentation of the UNC calculation and related QAL1 information was provided.
FUI 1 The QAL 2 tests, including measurements		Baseline campaign will start 14	OK. This FUI is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
with a standard reference method, will be performed by a laboratory which has an accredited quality assurance system according to EN ISO/IEC 17025. The QAL 2 tests will be performed prior to finalisation of the baseline campaign. DNV requests a copy of the QAL 2 report including the calculation of the overall uncertainty of AMS.		October, prior its finalization an accredited laboratory will performed the QAL2 test.	
FUI 2 DNV requests documented evidences of the calibration procedure for weekly zero and span checks as well as resulting Shewart charts.		AMS has not been installed yet. Once the equipment is installed QAL3 will be done according to methodology requirements.	OK. This FUI is closed.
FUI 3 How nitric acid flow to be monitored and what is is the uncertainty? The equipment planned measurement of concentration and determination of density should be provided.		FAFEN-BA will install a mass flow meter (Coriolis principle) to measure nitric acid flow. Concentration checkups are performed in analytical following the procedure number PE-4AF-00069 – "Acidez total ácido nítrico diluido e concentrado", available at Petrobras Quality Assurance System.	OK. This FUI is closed,
FUI 4 Commercial invoices from gauze supplier (or other relevant documentation) for the gauze composition for historical campaigns and baseline campaign should be provided.		Gauze supplier certifications for gauzes used during historical campaigns have been sent to DNV after the validation visit. Certifications of gauzes that will be used during baseline campaign will be sent to DNV once FAFEN-BA receives the document.	OK. This FUI is closed,

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Validation team conclusion
FUI 5 Documentation of the operating ranges for the max ammonia flow and ammonia/air ratio, should be from the gauze supplier (not only the spread sheet).		Maximum ammonia flow and maximum ammonia to air ratio have been calculated based on historical data available at the plant and not using gauze supplier information.	OK. This FUI is closed,

APPENDIX B

CERTIFICATES OF COMPETENCE

CERTIFICATE OF COMPETENCE

Trine Kopperud

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	Yes	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	*Sectoral scope 5*		
Technical Reviewer for (group of) methodologies:			
AM0021, AM0028, AM0034, AM0051	Yes		

Høvik, 2 May 2008

Michael Lehmann
Technical Director, Climate Change Services

CERTIFICATE OF COMPETENCE

Andrea Leiroz

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	Yes	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 18 July 2007

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Marco Ratton

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	--	***JI Validator:***	--
CDM Verifier:	--	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	--		

Høvik, 5 February 2007

Einar Telnes
Director, International Climate Change Services

Michael Lehmann
Technical Director

CERTIFICATE OF COMPETENCE

Raman Venkata Kakaraparthi

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJI-i1

GHG Auditor:	Yes		
CDM Validator:	Yes	***JI Validator:***	--
CDM Verifier:	Yes	***JI Verifier:***	--
Industry Sector Expert for Sectoral Scope(s):	Sectoral scope 5		
Technical Reviewer for (group of) methodologies:			
ACM002, AMS-I.A-D, AM0019, AM0026, AM0029, AM0045	Yes		

Høvik, 30 October 2007

Michael Lehmann
Technical Director, International Climate Change Services