VERIFICATION REPORT

ACHEMA AB

VERIFICATION OF THE

ACHEMA UKL-7 PLANT N2O ABATEMENT PROJECT

1ST PERIODIC

LINE 2 07/11/2008 - 12/10/2009
LINE 3 04/07/2008 - 16/06/2009
LINE 4 06/10/2008 - 28/04/2009
LINE 5 02/07/2008 - 14/01/2010
LINE 6 25/07/2008 - 21/04/2009
LINE 7 03/07/2008 - 01/11/2009
LINE 8 11/06/2008 - 20/11/2009

REPORT NO. LITHUANIA-VER/0004/2010

REVISION NO. 02

BUREAU VERITAS CERTIFICATION

Report No: LITHUANIA-VER/0004/2010

VERIFICATION REPORT

Date of first issue: 10 May 2010	Organizational unit: Bureau Veritas Certification Holding SAS
Client: ACHEMA AB	Client ref.: Andrejus Šostakas Head of Innovation Centre

Summary:

Bureau Veritas Certification has made the verification of the "ACHEMA UKL-7 plant N2O abatement project" of ACHEMA located in Jonava, Lithuania on the basis of UNFCCC criteria for the JI, as well as criteria given to provide for consistent project operations, monitoring and reporting, as well as the host country criteria under Track 2 procedure.

The verification scope is defined as a periodic independent review and ex post determination by the Accredited Independent Entity of the monitored reductions in GHG emissions during defined verification period, and consisted of the following three phases: i) desk review of the Monitoring Report, Project Design Document and the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) resolution of outstanding issues and the issuance of the final verification report and opinion. The overall verification, from Contract Review to Verification Report & Opinion, was conducted using Bureau Veritas Certification internal procedures. The first output of the verification process is a list of Clarification Requests, Corrective Actions Requests, Forward Actions Requests (CL, CAR and FAR), presented in Appendix A.

In summary, Bureau Veritas Certification confirms that the project is implemented as planned and described in validated and registered project design documents. Installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately. The monitoring system is in place and the project is generating GHG emission reductions. The GHG emission reduction is calculated without material misstatements.

Our opinion relates to the project's GHG emissions and resulting GHG emissions reductions reported and related to the valid and registered project baseline and monitoring, and its associated documents. Based on information seen and evaluated we confirm that the implementation of the project has resulted in 813567 t CO2e reductions during periods from 07/11/2008 through 12/10/2009, from 04/07/2008 through 16/06/2009, from 06/10/2008 through 28/04/2009, from 02/07/2008 through 22/04/2009, from 25/07/2008 through 21/04/2009, from 03/07/2008 through 01/11/2009 and from 11/06/2008 through 20/11/2009 on Lines 2,3,4,5,6,7,8 respectively.

Report No.: LITHUANIA-VER/0004/2010	Subject Group: JI	
Project title: ACHEMA UKL-7 plant N2O abatement project		
Work carried out by: Team Leader : Nadiia Kaiun Team Member : Tomas Paulaitis		
Work verified by: Ashok Mammen		
Date of this revision: 03.06.2010	Rev. No.: 3	Number of pages: 64

Indexing terms

Climate Change, Kyoto Protocol, JI, Emission Reductions, Verification

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Abbreviations

AIE	Accredited Independent Entity
BVCH	Bureau Veritas Certification Holding SAS
CAR	Corrective Action Request
CL	Clarification Request
CO_2	Carbon Dioxide
ERU	Emission Reduction Unit
FAR	Forward Action Request
GHG	Green House Gas(es)
IETA	International Emissions Trading Association
JI	Joint Implementation
JISC	JI Supervisory Committee
MoV	Means of Verification
MP	Monitoring Plan
PCF	Prototype Carbon Fund
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change

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1 INTRODUCTION

ACHEMA AB has commissioned Bureau Veritas Certification to verify the emissions reductions of its JI project "ACHEMA UKL-7 plant N2O abatement project" (hereafter called “the project”) at Jonava, Lithuania.
This report summarizes the findings of the first periodic verification of the project, performed on the basis of criteria given to provide for consistent project operations, monitoring and reporting, and contains a statement for the verified emission reductions.
The order includes first periodic verification of the project for the periods from 07/11/2008 through 12/10/2009, from 04/07/2008 through 16/06/2009, from 06/10/2008 through 28/04/2009, from 02/07/2008 through 22/04/2009, from 25/07/2008 through 21/04/2009, from 03/07/2008 through 01/11/2009 and from 11/06/2008 through 20/11/2009 on Lines 2,3,4,5,6,7,8 respectively. It is based on the Periodic Verification Report Template Version 3.0, December 2003, part of the Validation and Verification Manual (VVM) published by International Emission Trading Association (IETA).
First periodic verification consisted of site-visit and a desk review of the project documents including PDD, monitoring plan, determination report, monitoring report and further documentation.
The results of the determination were documented by Det Norske Veritas Certification AS (DNV) in the report: “ACHEMA UKL-7 plant N2O abatement project” Report No. 2008-086 dated 12th of February, 2008 (See Section 7).
Project is approved by the Lithuanian Ministry of Environment (Letter of Approval is presented, see Section 7) and registered under Track 2.

1.1 Objective

Verification is the periodic independent review and ex post determination by the AIE of the monitored reductions in GHG emissions during defined verification period.
The objective of verification can be divided in Initial Verification and Periodic Verification.
Initial Verification: The objective of an initial verification is to verify that the project is implemented as planned, to confirm that the monitoring system is in place and fully functional, and to assure that the project will generate verifiable emission reductions. A separate initial verification prior to the project entering into regular operations is not a mandatory requirement.
Periodic Verification: The objective of the periodic verification is to verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan; furthermore the periodic verification evaluates the GHG emission reduction data and express a conclusion with a high, but not absolute,

level of assurance about whether the reported GHG emission reduction data is free of material misstatements; and verifies that the reported GHG emission data is sufficiently supported by evidence, i.e. monitoring records.
In general, verification follows UNFCCC criteria referring to the Kyoto Protocol criteria, the JI rules and modalities, and the subsequent decisions by the JISC, as well as the host country criteria.

1.2 Scope

Verification scope is defined as an independent and objective review and ex post determination by the Designated Operational Entity of the monitored reductions in GHG emissions. The verification is based on the submitted monitoring report and the determined project design document including the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations. Bureau Veritas Certification has, based on the recommendations in the Validation and Verification Manual employed a risk-based approach in the verification, focusing on the identification of significant risks of the project implementation and the generation of ERUs.
The verification is not meant to provide any consulting towards the Client. However, stated requests for forward actions and/or corrective actions may provide input for improvement of the project monitoring towards reductions in the GHG emissions.
The audit team has been provided with a Monitoring Report version 5 dated 6th of May 2010 and underlying data records, covering the periods from 07/11/2008 through 12/10/2009, from 04/07/2008 through 16/06/2009, from 06/10/2008 through 28/04/2009, from 02/07/2008 through 22/04/2009, from 25/07/2008 through 21/04/2009, from 03/07/2008 through 01/11/2009 and from 11/06/2008 through 20/11/2009 on Lines 2,3,4,5,6,7,8 respectively.

1.3 GHG Project Description

The purpose of the project is the reduction of nitrous oxide (N2O) emissions from nitric acid production Lines at the nitric acid plant of AB Achema. The Company is situated in Jonava, Lithuania.

Achema operates two nitric acid production lines, one manufactured by Grande Paroisse, the other by UKL. This project relates to the UKL-7 line. The plant has a nameplate capacity of 2,800 tonnes of nitric acid per day of operation. UKL-7 plant consists of 8 separate production lines. Each line has its own ammonia and air preparation and feeding system, oxidation chamber, heat exchange system, turbine and absorption tower with individual production schedules (production,

shutdowns, primary catalyst gauze changes, operating conditions). Tail gas ducts of individual production lines are connected to common tail gas duct which takes the tail gas to 2 stacks, from which N2O is emitted to the atmosphere.

Basically, N2O formation is a result of unwanted chemical reactions that take place during the catalytic oxidation of ammonia which is the first stage in the nitric acid production process. Some part of the N2O is destroyed already in the ammonia oxidation reactor, while the non destroyed N2O is emitted with the tail gases. N2O is a high potential greenhouse gas with a green house warming potential (GWP) of 310.

Installation secondary N2O reduction catalyst underneath the primary catalyst precious metal catching and catalytic gauzes package in the ammonium burner was applied at 8 production lines of Achema UKL-7 nitric acid plant in period from April 2008 through December 2008. In the presence of this catalyst, the N2O is broken down into harmless constituents of N2 and O2.

According to guarantees provided by major secondary catalyst supplier installation of the secondary catalysts allows more than 70% reduction of the N2O content in the tail gas.

The secondary catalyst was placed in the appropriate support structure. The gap between the edge of the support structure and inside wall of the ammonia burner was sealed to prevent the process gas by-passing the secondary catalyst. In this way the technology ensures that all gases which pass through the primary catalyst also will pass through the secondary catalyst.

AMS installed at the operating plant is in compliance with the European norm EN14181, which assumes three levels of quality assurance of the measurement systems - QAL1, QAL2 and QAL3. The first level (QAL1) is assured and certified by the measurement equipment provider and it refers to the performance and accuracy of the system. The second level of quality assurance (QAL2) guarantees the correct installation of the AMS and its proper operation at the plant. The third level (QAL3) is aimed to guarantee the maintenance and regular proper functioning of the measurement equipment and the measurement data provided.

N2O emissions monitoring system is installed in 8 nitric acid lines of the plant, each with its own burner, absorption column and expansion turbine. Each production Line represents a separate nitric acid production unit independent from each other.

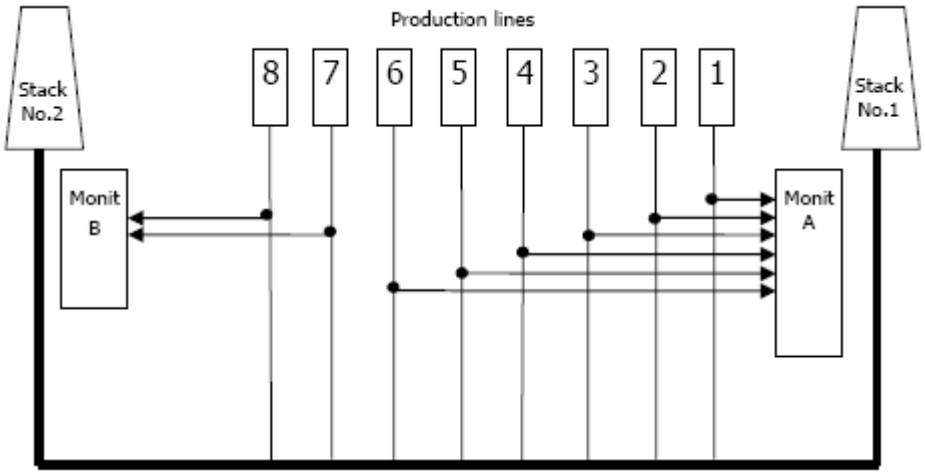

Figure 1 Diagram of the nitric acid production lines on ACHEMA

Primary catalyst is changed at different times thus it is necessary to measure the emissions from each Line individually. This means that eight separate sets of monitoring equipment are installed to measure tail gas flow, nitric acid production, nitric acid concentration, and the operating conditions. N2O concentration in the tail gas is measured by 3 switched concentration meters.

Methodology AM0034/Version 02 requires installation of an N2O monitoring system that includes both a gas volume flow meter to determine the tail gas mass volume flow and an infrared gas analyzer to determine the concentration of N2O. But tail gas N2O concentration meter and tail gas volume flow meter alone are not sufficient for a JI project purposes. In order of being able to calculate the baseline emission factor expressed as tonnage of N2O in t CO2e per 1 tonne of HNO3 (100%), it is necessary to include also HNO3 measurement, and in order of being able to document normal operating conditions it is necessary to include also operating conditions measurement.
Because of this the term Monitoring System (MS) is used to describe entire monitoring system directly and indirectly used for the JI purposes, while Automated Measurement System (AMS) covers only N2O emissions and tail gas mass volume part of the MS.
Monitoring System (MS) for purpose of this monitoring plan means:

monitoring system measuring operational conditions;
Ammonia volume flow
Ammonia temperature
Ammonia pressure
Primary air volume flow
Primary air temperature
Primary air pressure
Oxidation temperature
Oxidation pressure

nitric acid 100% concentrate production;
Nitric acid concentration
Nitric acid flow
Nitric acid temperature

newly installed measurement devices for measurement of N2O concentration and tail gas flow, temperature and pressure (AMS)
N2O concentration in the stack
Stack volume flow rate
Stack gas temperature
Stack gas pressure
Incorporation of the AMS into the MS by interfacing already existing and newly installed measurement devices is documented by the diagram below.

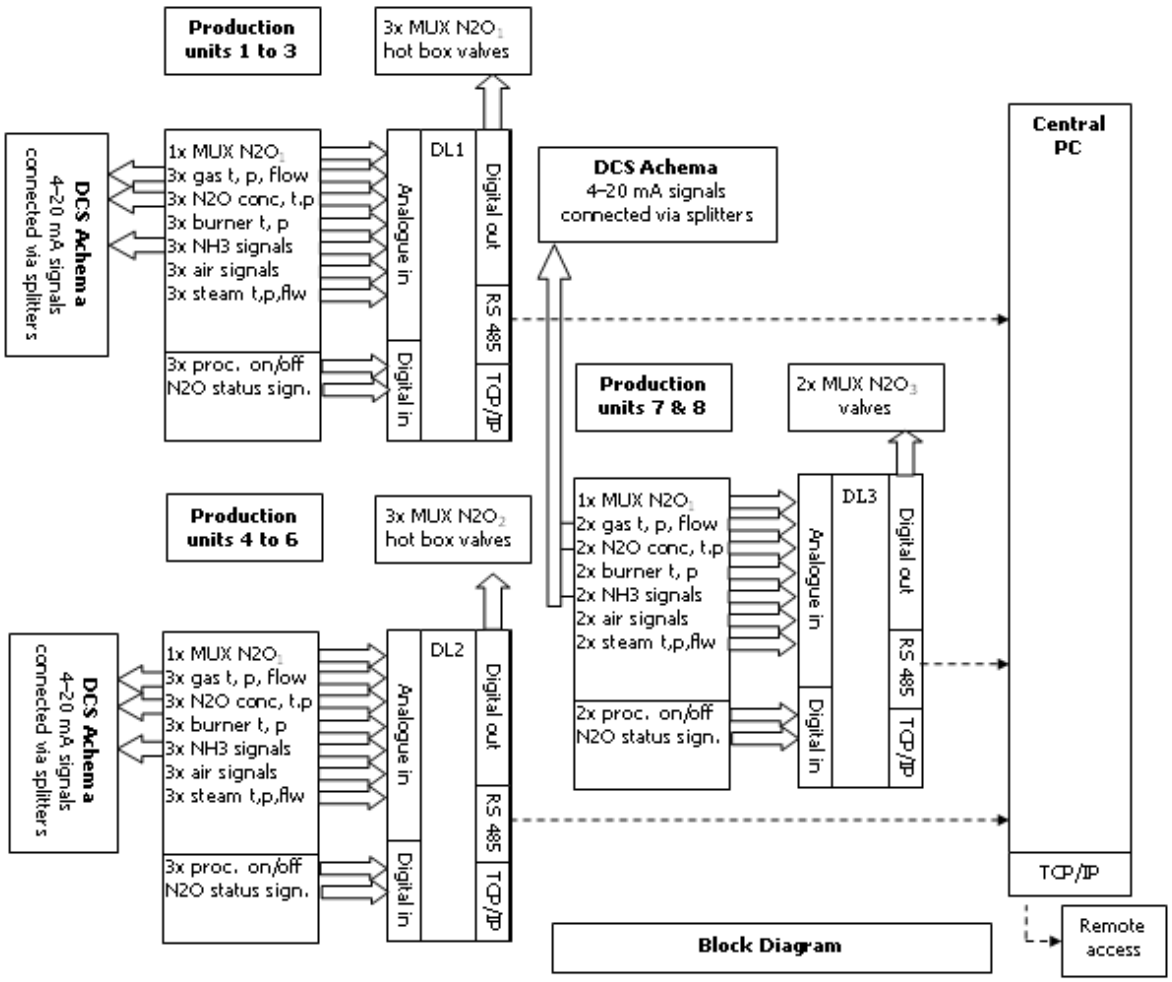

Figure 2 Incorporation of the AMS into MS on ACHEMA

Nitric acid production, ammonia flow and air flow including necessary temperature and pressure parameters are measured continuously.
Main purpose of the N2O automated measurement system (AMS) is to measure total mass of N2O emitted during particular campaigns (both baseline and project). In order of calculation of total mass of N2O emitted during particular campaign it is necessary to measure on an extractive basis the N2O concentration in a tail gas and on a non-extractive basis tail gas flow, pressure and temperature.
For purpose of the baseline emissions factor setting it is necessary to monitor and report operating conditions in all 8 burners. Namely:
Ammonia flow
Ammonia temperature
Ammonia pressure
Primary air flow
Primary air temperature
Primary air pressure
Oxidation temperature
Oxidation pressure

All these parameters are measured by the plant monitoring system as presented on diagrams below:

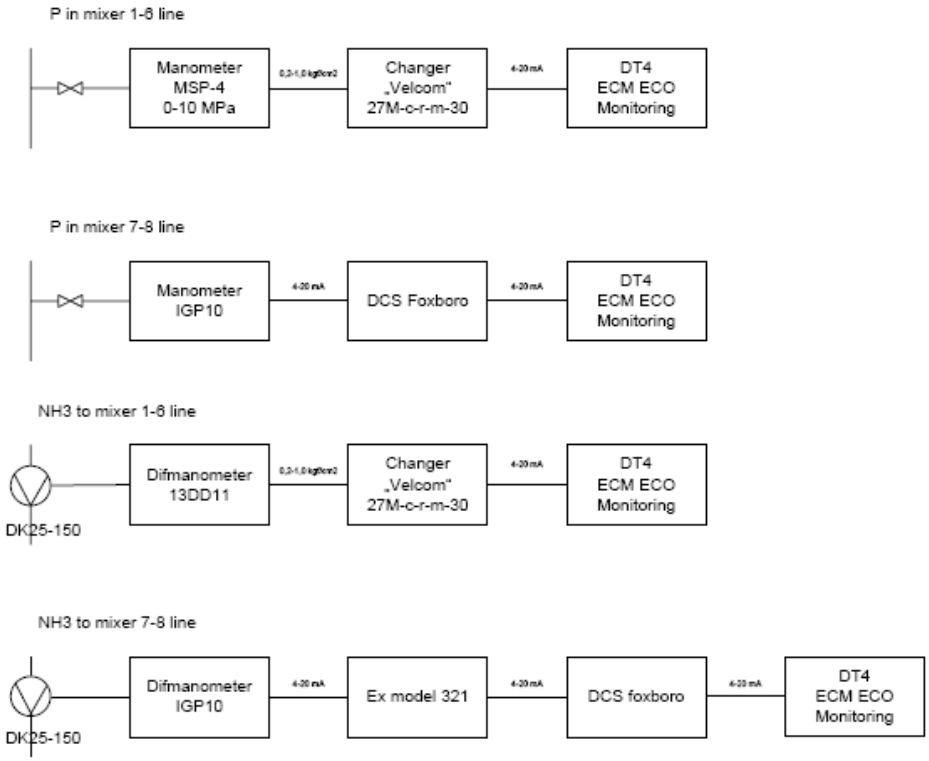

Figure 3 Diagram of devices necessary for measurement operating conditions in 8 burners of nitric acid production lines on Achema

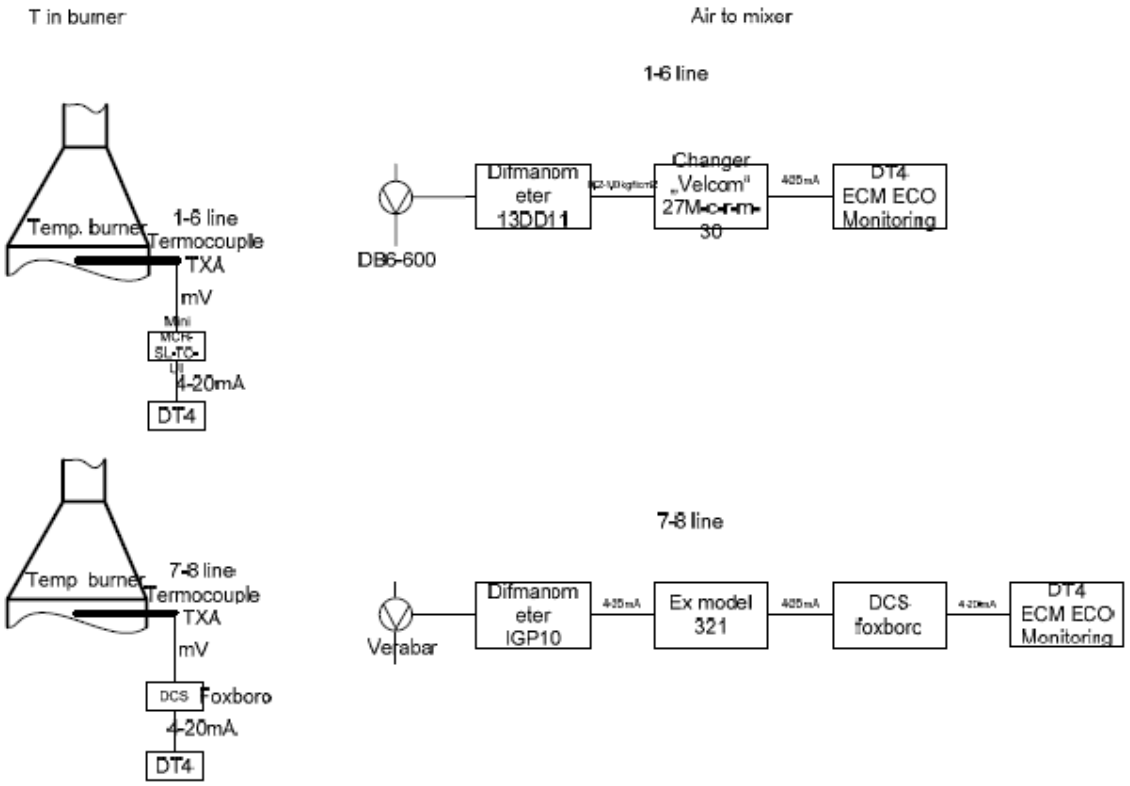

Figure 4 Diagram of devices necessary for measurement operating conditions in 8 burners of nitric acid production lines on Achema

Signals obtained from these measurement devices from production Lines 1-6 are converted from pneumatic to 4-20mA analog signals. Operating conditions measurement devices installed in production Lines 7-8 provide the 4-20mA signals which are digitalized and provided to the monitoring system dataloggers, which process them further. Maintenance procedures or the ammonia oxidation parameters follow the existing procedures for the operation of the nitric acid plant.

Data is displayed and registered in the monitoring system “Eco Logger” computer. Every day the hard copy (printed) data is review by a shift engineer and filed into identified binders held in the control room. Data collected, namely the electronic copy of the day report, during the last 24 hours, weekends or legal holidays is reviewed every day by the Deputy Head of the Plant and automation technician of the subsidiary “Sistematika”; Deputy Head shall also review the hard copy and analyze any malfunctions of data collection and parameter deviations of the process conditions.
After the end of the Pt catalyst campaign hard copy reports are further held in the office of Head Deputy of the Plant until it reaches the age of 2 years after the issuance of the last ERUs. The electronic version

reports are held in the EcoLogger computer located in the control room until it reaches the age of 2 years after the issuance of the ERUs.
After the end of the current month until the 5th day of the next month a summary of malfunctions, including daily maintenance and documentation book in Excel file in English for the last month is presented by the subsidiary Sistematika to the Head Deputy of the Plant. After the end of the current month until the 5th day of the next month Head Deputy shall send the following reviewed data to Vertis Environmental Finance (Vertis): Excel file of daily register and N2O monitoring data collect in EcoLogger system in Excel file. After the end Pt catalyst project campaign Head Deputy of the Plant shall send all project campaign data to Vertis in 10 days' period.
On the basis of N2O monitoring system data presented, entries in the daily register and daily maintenance and documentation book, Vertis shall perform N2O emission reduction calculations and shall prepare the monitoring report.

The separate treatment of the eight nitric acid lines and overlapping of the monitoring periods are allowed by the clarification issued Joint Implementation Supervisory Committee on its 13th Meeting: "Clarification regarding overlapping monitoring periods under the verification procedure under the Joint Implementation Supervisory Committee."

The Project meets all the requirements set out by the clarification:

1. The Project is composed of clearly identifiable components for which emission reductions or enhancements of removals are calculated independently;
2. Monitoring is performed independently for each of these components, i.e. the data/parameters monitored for one component are not dependent on/effect data/parameters (to be) monitored for another component;
3. The monitoring plan ensures that monitoring is performed for all components and that in these cases all the requirements of the JI guidelines and further guidance by the JISC regarding monitoring are met.

2 METHODOLOGY

The verification is as a desk review and field visit including discussions and interviews with selected experts and stakeholders.

In order to ensure transparency, a verification protocol was customized for the project, according to the Validation and Verification Manual (IETA/PCF) a verification protocol is used as part of the verification (see Section 7). The protocol shows, in a transparent manner, criteria

(requirements), means of verification and the results from verifying the identified criteria. The verification protocol serves the following purposes:
It organises, details and clarifies the requirements the project is expected to meet; and
It ensures a transparent verification process where the verifier will document how a particular requirement has been verified and the result of the verification;

The verification protocol consists of one table under Initial Verification checklist and four tables under Periodic verification checklist. The different columns in these tables are described in Figure 1.

The overall verification, from Contract Review to Verification Report & Opinion, was conducted using Bureau Veritas Certification procedures.

The completed verification protocol is enclosed in Appendix A to this report.

Initial Verification Protocol Table 1			
Objective	**Reference**	**Comments**	**Conclusion (CARs/FARs)**
The requirements the project must meet	Gives reference to where the requirement is found.	Description of circumstances and further comments on the conclusion	This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non-compliance of the stated requirements. Forward Action Request (FAR) indicates essential risks for further periodic verifications.

Periodic Verification Checklist Protocol Table 2: Data Management System/Controls		
Identification of potential reporting risk	**Identification, assessment and testing of management controls**	**Areas of residual risks**
The project operator's data management system/controls are assessed to identify reporting risks and to assess the data management system's/control's ability to mitigate reporting risks. The GHG data management system/controls are assessed against the expectations detailed in the table.	A score is assigned as follows: • Full - all best-practice expectations are implemented. • Partial - a proportion of the best practice expectations is implemented • Limited - this should be given if little or none of the system component is in place.	Description of circumstances and further commendation to the conclusion. This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non compliance with stated requirements. The corrective action requests are numbered and presented to the client in the verification report. The Initial Verification has additional Forward Action Requests (FAR). FAR indicates essential risks for further periodic verifications.

Periodic Verification Protocol Table 3: GHG calculation procedures and management control testing		
Identification of potential reporting risk	**Identification, assessment and testing of management controls**	**Areas of residual risks**
Identify and list potential reporting risks based on an assessment of the emission estimation procedures, i.e. ➢ the calculation methods, ➢ raw data collection and sources of supporting documentation, ➢ reports/databases/information systems from which data is obtained. Identify key source data. Examples of source data include metering records, process monitors, operational logs, laboratory/analytical data, accounting records, utility data and vendor data. Check appropriate calibration and maintenance of equipment, and assess the likely accuracy of data supplied. Focus on those risks that impact the accuracy, completeness and consistency of the reported data. Risks are weakness in the GHG calculation systems and may include: ➢ manual transfer of data/manual calculations, ➢ unclear origins of data, ➢ accuracy due to technological limitations, ➢ lack of appropriate data protection measures? For example, protected calculation cells in spreadsheets and/or password restrictions.	Identify the key controls for each area with potential reporting risks. Assess the adequacy of the key controls and eventually test that the key controls are actually in operation. Internal controls include (not exhaustive): ➢ Understanding of responsibilities and roles ➢ Reporting, reviewing and formal management approval of data; ➢ Procedures for ensuring data completeness, conformance with reporting guidelines, maintenance of data trails etc. ➢ Controls to ensure the arithmetical accuracy of the GHG data generated and accounting records e.g. internal audits, and checking/ review procedures; ➢ Controls over the computer information systems; ➢ Review processes for identification and understanding of key process parameters and implementation of calibration maintenance regimes ➢ Comparing and analysing the GHG data with previous periods, targets and benchmarks. When testing the specific internal controls, the following questions are considered: 1. Is the control designed properly to ensure that it would either prevent or detect and correct any significant misstatements? 2. To what extent have the internal controls been implemented	Identify areas of residual risks, i.e. areas of potential reporting risks where there are no adequate management controls to mitigate potential reporting risks Areas where data accuracy, completeness and consistency could be improved are highlighted.

	according to their design; 3. To what extent have the internal controls (if existing) functioned properly (policies and procedures have been followed) throughout the period? 4. How does management assess the internal control as reliable?	

Periodic Verification Protocol Table 4: Detailed audit testing of residual risk areas and random testing		
Areas of residual risks	**Additional verification testing performed**	**Conclusions and Areas Requiring Improvement (including Forward Action Requests)**
List the residual areas of risks (Table 2 where detailed audit testing is necessary. In addition, other material areas may be selected for detailed audit testing.	The additional verification testing performed is described. Testing may include: 1. Sample cross checking of manual transfers of data 2. Recalculation 3. Spreadsheet 'walk throughs' to check links and equations 4. Inspection of calibration and maintenance records for key equipment ➢ Check sampling analysis results ➢ Discussions with process engineers who have detailed knowledge of process uncertainty/error bands.	Having investigated the residual risks, the conclusions should be noted here. Errors and uncertainties should be highlighted. Errors and uncertainty can be due to a number of reasons: ➢ Calculation errors. These may be due to inaccurate manual transposition, use of inappropriate emission factors or assumptions etc. ➢ Lack of clarity in the monitoring plan. This could lead to inconsistent approaches to calculations or scope of reported data. ➢ Technological limitations. There may be inherent uncertainties (error bands) associated with the methods used to measure emissions e.g. use of particular equipment such as meters. ➢ Lack of source data. Data for some sources may not be cost effective or practical to collect. This may result in the use of default data which has been derived based on certain assumptions/conditions and which will therefore have varying applicability in different situations. The second two categories are explored with the site personnel, based on their knowledge and experience of the processes. High risk process parameters or source data (i.e. those with a significant influence on the reported data, such as meters) are reviewed for these uncertainties.

Verification Protocol Table 5: Resolution of Corrective Action and Clarification Requests			
Report clarifications and corrective action requests	**Ref. to checklist question in tables 2/3**	**Summary of project owner response**	**Verification conclusion**
If the conclusions from the Verification are either a Corrective Action Request or a Clarification Request, these should be listed in this section.	Reference to the checklist question number in Tables 2, 3 and 4 where the Corrective Action Request or Clarification Request is explained.	The responses given by the Client or other project participants during the communications with the verification team should be summarized in this section.	This section should summarize the verification team's responses and final conclusions. The conclusions should also be included in Tables 2, 3 and 4, under "Final Conclusion".

Figure 1 Verification protocol tables

2.1 Review of Documents

The Monitoring Report (MR) version 2 dated 8th of February 2009 submitted by Vertis Finance Kft. and additional background documents related to the project design and baseline, i.e. country Law, Project Design Document (PDD), applied methodology, Kyoto Protocol, Clarifications on Verification Requirements to be checked were reviewed. To address Bureau Veritas Certification corrective action and clarification requests, Vertis Finance Kft. revised the MR and resubmitted it on 6th of May 2010 as version 5.

The verification findings presented in this report relate to the project as described in the PDD version 5 and Monitoring Report version 5.

2.2 Follow-up Interviews

On 05/03/2010 Bureau Veritas Certification performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of Achema AB and developer of JI project were interviewed (see 7 References). The main topics of the interviews are summarized in Table 1.

Table 1 Interview topics

Interviewed organization	Interview topics
Achema AB	Organizational structure. Responsibilities and authorities. Training of personnel. Quality management procedures and technology. Implementation of equipment (records). Metering equipment control. Metering record keeping system, database. Social impacts. Environmental impacts.
Consultant: Vertis Finance Kft.	Baseline methodology. Monitoring plan.

	Monitoring report. Deviations from PDD.

2.3 Resolution of Clarification, Corrective and Forward Action Requests

The objective of this phase of the verification is to raise the requests for corrective actions and clarification and any other outstanding issues that needed to be clarified for Bureau Veritas Certification positive conclusion on the GHG emission reduction calculation.

Findings established during the initial verification can either be seen as a non-fulfilment of criteria ensuring the proper implementation of a project or where a risk to deliver high quality emission reductions is identified.

Corrective Action Requests (CAR) are issued, where:
i) there is a clear deviation concerning the implementation of the project as defined by the PDD;
ii) requirements set by the MP or qualifications in a verification opinion have not been met; or
iii) there is a risk that the project would not be able to deliver (high quality) ERUs.

Forward Action Requests (FAR) are issued, where:
iv) the actual status requires a special focus on this item for the next consecutive verification, or
v) an adjustment of the MP is recommended.

The verification team may also use the term Clarification Request (CL), which would be where:
vi) additional information is needed to fully clarify an issue.

To guarantee the transparency of the verification process, the concerns raised are documented in more detail in the verification protocol in Appendix A.

3 VERIFICATION FINDINGS

In the following sections, the findings of the verification are stated. The verification findings for each verification subject are presented as follows:
1) The findings from the desk review of the original project activity documents and the findings from interviews during the follow up visit are summarized. A more detailed record of these findings can be found in the Verification Protocol in Appendix A.
2) The conclusions for verification subject are presented.

In the final verification report, the discussions and the conclusions that followed the preliminary verification report and possible corrective action requests are encapsulated in this section.

3.1 Remaining issues CAR's, FAR's from previous determination/verification

One task of the verification is to check the remaining issues from the previous determination and verification or issues which are clearly defined for assessment in the PDD. The determination report prepared by Det Norske Veritas Certification AS (DNV) does not note any open issues.

3.2 Project Implementation

3.2.1 Discussion

Installing secondary N2O reduction catalyst underneath the primary catalyst precious metal catching and catalytic gauzes package in the ammonium burner as a N2O abatement technology was applied at 8 production lines of Achema plant according to the Monitoring Plan, described in the PDD version 5 and Monitoring Report version 5. Secondary catalysts were installed in all ammonia oxidation reactors of 8 production lines.

3.2.2 Findings

Corrective action request No 4

Please, provide at least one written project approval by a Party involved in the JI project, other than the host Party(ies) before submitting the first verification report for publication. See requirements in the http://ji.unfccc.int/Ref/Documents/Glossary_JI_terms.pdf.

Response

-

Conclusion of verification team

-

3.2.3 Conclusion

-

3.3 Internal and External Data

3.3.1 Discussion

The monitoring approach in the Monitoring Plan of the PDD version 5 requires monitoring and measurement of variables and parameters

necessary to quantify the baseline emissions and project emissions in a conservative and transparent way.

For the purpose of the transparent calculation of emission reductions, establishing the baseline emission factor as tonnage of N2O in t CO2e per 1 tone of HNO3 (100%) and in order to document normal operating conditions the incorporation approach of the AMS into the MS was performed by project participants. It means that term Monitoring System (MS) is used to describe entire monitoring system directly and indirectly used for the JI purposes, while Automated Measurement System (AMS) covers only N2O emissions and tail gas mass volume part of the MS.
Monitoring System (MS) includes parameters which are measured according to the established monitoring plan, in particular:

monitoring system measuring operational conditions;
Ammonia volume flow
Ammonia temperature
Ammonia pressure
Primary air volume flow
Primary air temperature
Primary air pressure
Oxidation temperature
Oxidation pressure

nitric acid 100% concentrate production;
Nitric acid concentration
Nitric acid flow
Nitric acid temperature

newly installed measurement devices for measurement of N2O concentration and tail gas flow, temperature and pressure (AMS) N2O concentration in the stack
Stack volume flow rate
Stack gas temperature
Stack gas pressure
Incorporation of the AMS into the MS by interfacing already existing and newly installed measurement devices is documented by the Figure 2 below.

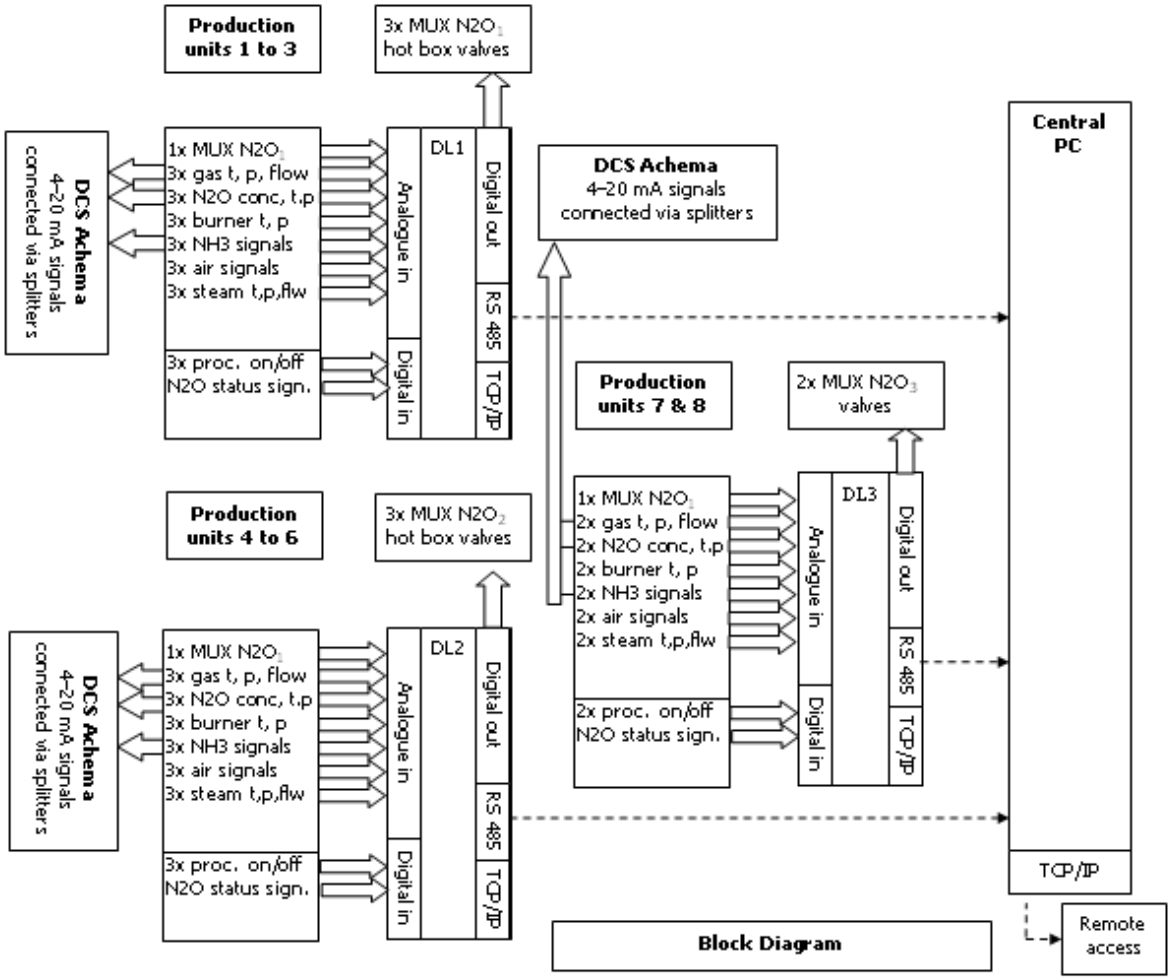

Figure 2 Incorporation of the AMS into MS on ACHEMA

Baseline emission factor has been established on the Line-specific basis. N2O concentration and gas volume flow are monitored by monitoring system complying with requirements of the European Norm 14181.

Monitoring system provides separate readings for N2O concentration and gas flow volume for every hour of operation as an average of the measured values for the previous 60 minutes.

Measurement results can be distorted before and after periods of downtime or malfunction of the monitoring system and can lead to mavericks. To eliminate such extremes and to ensure a conservative approach, the following statistical evaluation is applied to the complete data series of N2O concentration as well as to the data series for gas volume flow. The statistical procedure is applied to data obtained after eliminating data measured for periods where the plant operated outside the permitted ranges:

a) Calculate the sample mean (x)

b) Calculate the sample standard deviation (s)

c) Calculate the 95% confidence interval (equal to 1.96 times the standard deviation)
d) Eliminate all data that lie outside the 95% confidence interval
e) Calculate the new sample mean from the remaining values (volume of stack gas
(VSG) and N2O concentration of stack gas (NCSG))
The average mass of N2O emissions per hour is estimated as product of the NCSG and VSG.
The N2O emissions per campaign are estimates product of N2O emission per hour and the total number of complete hours of operation of the campaign using the following equation:
BEBC = VSGBC * NCSGBC * 10-9 * OHBC (tN2O)
The Line specific baseline emissions factor representing the average N2O emissions per tonne of nitric acid over one full campaign is derived by dividing the total mass of N2O emissions by the total output of 100% concentrated nitric acid during baseline campaign.
The overall uncertainty of the monitoring system has been determined by the QAL2 report and the measurement error is expressed as a percentage (UNC). The N2O emission factor per tonne of nitric acid produced in the baseline period (EFBL) has been then be reduced by the percentage error as follows:
EFBL = (BEBC / NAPBC) (1 – UNC/100) (tN2O/tHNO3) where:

Variable Definition
EFBL Baseline N2O emissions factor (tN2O/tHNO3)
BEBC Total N2O emissions during the baseline campaign (tN2O)
NCSGBC Mean concentration of N2O in the stack gas during the baseline campaign (mgN2O/m3)
OHBC Operating hours of the baseline campaign (h)
VSGBC Mean gas volume flow rate at the stack in the baseline measurement period (m3/h)
NAPBC Nitric acid production during the baseline campaign (tHNO3)
UNC Overall uncertainty of the monitoring system (%), calculated as the combined uncertainty of the applied monitoring equipment.

The average historic campaign length (CL normal) defined as the average campaign length for the historic campaigns used to define operating condition (the previous five campaigns), has not been used as a cap on the length of the baseline campaign because of shorter project campaigns.

Same statistical evaluation that was applied to the baseline data series has been applied to
the project data series:
a) Calculate the sample mean (x)
b) Calculate the sample standard deviation (s)
c) Calculate the 95% confidence interval (equal to 1.96 times the standard deviation)

d) Eliminate all data that lay outside the 95% confidence interval
e) Calculate the new sample mean from the remaining values

PEn = VSG * NCSG * 10-9 * OH (tN2O)

where:
VSG Mean stack gas volume flow rate for the project campaign (m3/h)
NCSG Mean concentration of N2O in the stack gas for the project campaign
(mgN2O/m3)
PEn Total N2O emissions of the nth project campaign (tN2O)
OH Is the number of hours of operation in the specific monitoring period (h)

Because this campaign was first project campaign on 8 production lines of Achema there has been no moving average emission factor established yet for this campaign.
Because this campaign was first project campaign on 8 production lines of Achema there has been no minimum average emission factor established yet for this campaign. This factor will be established after 10th project campaign.

The emission reductions for the project activity during this campaign have been determined by deducting the campaign-specific emission factor from the baseline emission factor and multiplying the result by the production output of 100% concentrated nitric acid over the campaign period and the GWP of N2O:

ER = (EFBL – EFP) * NAP *GWPN2O (tCO2e)

where:
Variable Definition
ER Emission reductions of the project for the specific campaign (tCO2e)
NAP Nitric acid production for the project campaign (tHNO3). The maximum value of NAP shall not exceed the design capacity.
EFBL Baseline emissions factor (tN2O/tHNO3)
EFP Emissions factor used to calculate the emissions from this particular
campaign (i.e. the higher of EFma,n and EFn).

The list of all monitoring equipment with the internal numbers, established due to the monitoring system of the plant and calibration dates is presented in the “Calibration plan of N2O monitoring system related to the measuring equipment in UKL-7 nitric acid plant” B.”

3.3.2 Findings

Corrective action request No 1
Please, provide EF_{reg} calculations in the monitoring report. If this regulatory limit is lower than the baseline factor, then the regulatory baseline shall be used for all calculations.

Response
Section on the EFreg calculation is included in the last section of the Monitoring Report version 5 “Comparison of the baseline emission factors against N2O mass limit in the IPPC permit“.

Conclusion of verification team
Calculation of EFreg is used because IPCC permit define only N2O limit in tones, not it tones kgN2O/tHNO3.
EFreg is 8.06 kgN2O/tHNO3 and 8.16 kgN2O/tHNO3 for years 2008 and 2009 respectively.
Baseline emission factor (7,62 kgN2O/tHNO3) is calculated using sumproduct approach, because IPCC permit limits do not define N2O emission level for each separate production line. Sumproduct baseline emission factor is lower than the regulatory emission factors and thus all actual measured baseline emission factors is used for calculation of emission reductions achieved.
These approaches and calculation results is found acceptable, hence CR 1 is closed.

Corrective action request No 2
Please, round up “Baseline emission factor” and “Project emission factor” in the CLACULATION MODEL sheet “Summary” to two digits after the comma. Without this rounding-up, the emission reduction data results declared in the monitoring report tables “T 1 Emission reduction calculations” do not correspond to the calculation results using formula. For example, see Line 2, Project campaign 1, Table “T 1 Emission reduction calculations”: (7,77-1,77)*12392*310=23049 (not 23041).

Response
Rounding is introduced into the model calculations (version 2) as requested.

Conclusion of verification team
Corrections has been verified and found acceptable, hence CAR2 is closed.

Corrective action No 3
Please, explain a change in the composition of the ammonia oxidation catalyst used in the baseline campaign to a composition other than that used in the previous five campaigns according to the requirements of AM0034. Also please, justify why parameters GS_{normal} and G_{normal} are not declared in the monitoring report. For example: for line 7 baseline campaign Heraeus catalyst was used, and for previous campaigns Johnson Matthey and Umicor were used. Project proponent has provided certificates that Johnson Matthey catalyst composition is 76Pt/4Rh/20Pd, Heraeus catalyst composition is 63/Pt/4Rh/33Pd, the composition of Umicor is not attached.

Response
Tables T2 of monitoring report version 5 is updated so it lists now suppliers and compositions of primary catalysts during 5 historic campaigns. Selection of primary catalysts is determined by technical parameters of their use and price levels offered by suppliers in specific time.
Primary catalysts used during the baseline campaign, if other than used in previous campaign/s, did not increase emissions of N2O as confirmed by relevant statements provided to the verifier.

Conclusion of verification team
Composition of the some primary catalyst gauzes is still not available because suppliers treat it as know-how. However, provided statements of the primary catalyst suppliers (Johnson Matthey, Umicor, Heraeus) is found acceptable, hence CAR 3 is closed.

Clarification action request No 4
Please, explain in the monitoring report how stack gas water content is excluded from normalized stack gas mass flow value, because this calculation is not inside the CALCULATION MODEL and is not explained in the MODEL USER MANUAL. Please, provide evidence that stack gas water content measuring equipment is also calibrated.

Response
Treatment of the stack gas water content is explained in monitoring report version 5 on pages 14 and 15. Steam F, T and P meter calibration passports is provided to verification team.

Conclusion of verification team
Explanation and calibration records is found acceptable, hence CR 4 is closed. However, requirements of stack water content treatment is missing in the monitoring plan, therefore FAR 7 is issued with request to revise monitoring report accordingly.

Clarification action request No 5

Please, explain a change in the composition of the ammonia oxidation catalyst used in the baseline campaign to a composition other than that used in the previous five campaigns according to the requirements of AM0034. Also please, justify why parameters GS_{normal} and Gn_{ormal} are not declared in the monitoring report. For example: for line 7 baseline campaign Heraeus catalyst was used, and for previous campaigns Johnson Matthey and Umicor were used. Project proponent has provided certificates that Johnson Matthey catalyst composition is 76Pt/4Rh/20Pd, Heraeus catalyst composition is 63/Pt/4Rh/33Pd, the composition of Umicor is not attached.

Response

1st response:

Use of different primary catalysts in terms of their supplier and their composition is allowed by the methodology and it represents business as usual scenario in nitric acid plants across the world and especially in type of nitric acid plants like the Achema UKL-7, where 8 lines falling under the scope of the JI project are operated. Different composition of the FTC is caused by addition of additional layers serving for the precious metal catchment and recovery. This addition has no impact on the level of the N2O formation. This issue has been discussed and positively determined by the DNV, which had not raised any objections to this usual practice in Achema in its final determination report (conclusion to the CR4 of the Determination report on its page A-32) and this approach has been positively determined "also in case of other projects.

This approach is also in line with the CDM AM0034 methodology “(i) The baseline catalyst composition is considered as common practice in the industry” and “(ii) The change in catalyst composition is justified by its availability, performance, relevant literature”.

Parameters of primary catalyst suppliers during 5 historic campaigns can be found in tables T2 of the monitoring report and information on their compositions was provided to the determinator during the determination stage and also to the verifier in the verification stage. Some primary catalyst suppliers treat information on composition of their primary catalyst as confidential information and thus this information is provided directly to the verifier only.

Regarding the Umicore composition this figure can be found in the certificate provided, which states that MKS modular katalysator system TM is made of Pt/Rh 95/5 %.

2nd response:

Requested statements of the primary catalyst suppliers (have been provided to verification team. Monitoring report tables 2 has been updated.

Conclusion of verification team

1st conclusion:
Actually, DNV has transferred responsibility to the verifier, see final sentence of CR4: "The final verification of the permitted ranges, the normal campaign length and catalyst installed are subject to be finally verified by the verifying DOE.
Therefore please provide composition of the catalyst in the monitoring report Tables T2 with reference to certificate date or number. If catalyst suppliers have not provided information on composition, please indicate this in this Table.
Please prove statement that different composition has no impact on the level of the N2O formation by literature or supplier documentation or catalogues.

Final conclusion: statements of the primary catalyst suppliers (Umicore, Johnson Matthey, Heraeus) was reviewed. Suppliers stated that primary catalyst used do not increase N2O emission level in normal operating conditions. Therefore CL5 is closed, despite that composition of primary catalyst used is still not available for all primary catalyst gauzes (in some cases suppliers treats this information as know-how and are not ready to disclose it).

Clarification action request No 6
Due to AMS malfunction, mentioned in the commissioning protocol (04-11/09/2007), the AMS readings should be eliminated from the output data series (AMS was out of operation and these concentration measurement data were error readings). Please justify why the AMS status in column Z is "TRUE" for 04 September until 11 September 2007 period (see Line 2, for example).

Response
Emission reductions calculation model has been updated and it reflects now all AMS malfunction occurrences as recorded in the Achema UKL-7 maintenance book.

Conclusion of verification team
Calculation model version 2 was verified and no related mistakes or misstatements were not found. Therefore CR 6 is closed.

3.3.3 Conclusion

The project complies with the requirements.

3.4 Environmental and Social Indicators

3.4.1 Discussion

Secondary catalysts which are installed in all ammonia oxidation reactors of 8 production lines the enterprise breaks down N2O formation during oxidation process on N2 and O2 and thus leads to decrease of harmful emissions. Project implementation will lead to improvement of ecological climate of the region, increase of payments to the budgets of all levels for social needs, prevention of reduction of working places and better working conditions at Achema.

3.4.2 Findings

None

3.4.3. Conclusion

The project complies with the JI requirements as well as with the local requirements.

3.5 Management and Operational System

3.5.1 Discussion

N2O emissions monitoring system is installed in both nitric acid lines A and B. It consists of the measurement devices part and data processing and storage part. Measuring instruments are in accordance with process and technical project made on basis of accepted methodology AM0034. According to the established Monitoring Plan in the PDD version 5 MS is incorporated into MS in order to fulfill requirements of the AM0034 methodology Version 02 and transparent calculations of the emission reductions.

Monitoring system (MS)of N2O emission includes:
newly installed measurement devices for measurement of N2O concentration and tail gas flow, temperature and pressure (AMS)
N2O concentration in the stack
Stack volume flow rate
Stack gas temperature
Stack gas pressure
Main purpose of the N2O automated measurement system (AMS) is to measure total mass of N2O emitted during particular campaigns (both baseline and project). In order of calculation of total mass of N2O emitted during particular campaign it is necessary to measure on an extractive basis the N2O concentration in a tail gas and on a non-extractive basis tail gas flow, pressure and temperature.

Nitric acid production, ammonia flow and air flow including necessary temperature and pressure parameters are measured continuously.

Signals obtained from these measurement devices from production Lines 1-6 are converted from pneumatic to 4-20mA analog signals. Operating conditions measurement devices installed in production Lines 7-8 provide the 4-20mA signals which are digitalized and provided to the monitoring system dataloggers, which process them further. Maintenance procedures or the ammonia oxidation parameters follow the existing procedures for the operation of the nitric acid plant.

After the end of the Pt catalyst campaign hard copy reports are further held in the office of Head Deputy of the Plant until it reaches the age of 2 years after the issuance of the last ERUs. The electronic version reports are held in the EcoLogger computer located in the control room until it reaches the age of 2 years after the issuance of the ERUs.
After the end of the current month until the 5th day of the next month a summary of malfunctions, including daily maintenance and documentation book in Excel file in English for the last month is presented by the subsidiary Sistematika to the Head Deputy of the Plant. After the end of the current month until the 5th day of the next month Head Deputy shall send the following reviewed data to Vertis Environmental Finance (Vertis): Excel file of daily register and N2O monitoring data collect in EcoLogger system in Excel file. After the end Pt catalyst project campaign Head Deputy of the Plant shall send all project campaign data to Vertis in 10 days' period.
On the basis of N2O monitoring system data presented, entries in the daily register and daily maintenance and documentation book, Vertis shall perform N2O emission reduction calculations and shall prepare the monitoring report.

3.5.2 Findings

None.

3.5.3 Conclusion

The Monitoring Report and the Management and Operational Systems are eligible for reliable project monitoring.

4 FIRST PERIODIC VERIFICATION FINDINGS

4.1 Completeness of Monitoring

4.1.1 Discussion

The reporting procedures reflect the monitoring plan completely. It is confirmed that the monitoring report does comply with the monitoring methodology and PDD.
All parameters were determined as prescribed. The complete data is stored electronically and documented. The necessary procedures have been defined in internal procedures.

4.1.2 Findings

4.1.3 Conclusion

The project complies with the requirements.

4.2 Accuracy of Emission Reduction Calculations

4.2.1 Discussion

The audit team confirms that emission reduction calculations have been performed according to the Monitoring Plan.
The overall uncertainty was established due to the QAL2 test results, as required by EN14181. Level of uncertainty is expressed in the calculations of the Baseline emission factor and Project emission factor, which are provided in the Emission Reduction model for the Project.
Some of the monitoring parameters that are used in the calculation of the baseline and project emissions are measured directly with the use of special equipment while others are estimated with the use of appropriate statistical approach, described in the Monitoring Report version 10.
As required in the applicable norm EN14181: “The relation between the instrument readings of the recording measuring procedure and the quantity of the measuring objects has to be described by using a suitable convention method. The results have to be expressed by a regression analysis.” The general formula of the regression line, established in the EN14181 and used in the Calibration Report is:
$Y = a + bX$
where:
X is the measured value of the instrument in mA
Y is the value of the parameter being objective of the measurement

a is a constant of the regression line
b is the slope of the regression line
After a comparative test the laboratory issued the old and new regression lines properties, namely “a” and “b” applying for all of the measured parameters that are subject to calibration as stated in the Calibration Report.
The QAL2 corrections are based on the fact that the actual analog current outputs (in mA) of the measurement instruments are relevant for both, the old and new regression lines:
Xo=Xn=X
where:
Xn: X new
Yo: Y old
This allows to derive a calibrating formula that gives us the corrected value of the measured physical parameters. The applied calibrating equation is:
Yn=An + (Bn/Bo)*(Yo-Ao)
The units returned by the AMS in “mgN2O/nm3” and “1000 nm3/h” stand for normalized cubic meters of the gas volume at normal gas conditions (0° C, 1 atm.).

4.2.2 Findings

None

4.2.3 Conclusion

The project complies with the requirements.

4.3 Quality Evidence to Determine Emissions Reductions

4.3.1 Discussion

Concerning verification the calculation of emission reductions is based on internal data. The origin of those data was explicitly checked. Further on, entering and processing of those data in the Emission Reduction Model for 8 production Lines was checked where predefined algorithms compute the annual value of the emission reductions. All equations and algorithms used in the different workbook sheets were checked. Inspection of calibration and maintenance records for key equipment was performed for all relevant meters.
Necessary procedures have been defined in internal procedures and additional internal documents relevant for the determination of the various parameters on daily basis.

4.3.2 Findings

Forward action request No 1

Please, define the requirements for the CALCULATION MODEL internal

review and control (e.g. testing, formulas protection) needed to ensure the reliability of calculations with this tool.

Response
Emission reductions calculation model has been develop by Vertis emission reductions calculation model expert Laszlo Pasztor. Model was reviewed by two other Vertis experts Ivo Petrov and Akos Farkas. Model was subject also to the initial verification which had concluded the positive assessment of the Model in its section G.6 (CAR 1 and CAR 2 included in the assessment of the G.6 section has been already settled during the initial verification stage). Model has been also used (taking into account project specifics as the case may be) for other JI project which has passed positively the first periodic verification stage. Locking the emission reductions calculation model is not practical and it does not increase integrity of emission data. Furthermore, JISC does not accept calculation models protected by passwords.

Conclusion of verification team
FAR is regarding CALCULATION MODEL testing and control in order to prevent accident changes in MODEL and formulas, not access passwords. Please define requirements how you ensure that model will not be changed or damaged incidentally in the future. External verification is not intended to change internal control (objective of internal control is to minimize risk of errors and misstatements).

This FAR will be verified during second periodic verification.

Forward action request No 2

It is recommended to include JI MANUAL into the ISO 9001 and ISO 14001 internal audit scope. The information for the management review might also include a comprehensive review of JI management system effectiveness, problem review and improvement recommendations.

Response
In the nitric acid plant internal auditors do internal audits of nitric acid manufacturing managing according standards ISO 9001 and ISO 14001 once per year. In to the scope of both audits will be included review of JI management according JI MANUAL BI-122-02.

Conclusion of verification team
This FAR will be verified during second periodic verification.

Forward action request No 3

Please, document the requirements for access restrictions, editor rights control and back-up procedure (including back-up tests).

Response

Emission data access restrictions, editor rights and back-up procedures are described in the AMS software configuration manuals attached. This setup of the AMS software allows storing all raw data required and transparently executing all further data calculations (including the QAL2 adjustments and AM0034 calculations) in the emission reductions calculation model.
JI manual was updated. Software description and use guidelines are included into Chapter 6 of JI Manual "List of main documents used for JI project".

Conclusion of verification team
This FAR will be verified during second periodic verification.

Forward action request No 4

Please, define the storage place and retention period requirements for all JI electronic and paper documents/records mentioned in the JI manual, not only for AMS records.

Response
JI manual is updated accordingly.

Conclusion of verification team
Revised JI manual is reviewed and found acceptable, hence FAR4 is closed. But please register this change in the JI manual's "sheet for registrations of revisions"

4.3.3 Conclusion

The project complies with the requirements.

4.4 Management System and Quality Assurance

4.4.1 Discussion

AMS installed at the operating plant is in compliance with the European norm EN14181 as required per Approved Methodology AM0028, which assumes three levels of quality assurance of the measurement systems - QAL1, QAL2 and QAL3. The first level (QAL1) is assured and certified by the measurement equipment provider and it refers to the performance and accuracy of the system. The second level of quality assurance (QAL2) guarantees the correct installation of the AMS and its proper operation at the plant. The third level (QAL3) is aimed to guarantee the maintenance and regular proper functioning of the measurement equipment and the measurement data provided.
Measurement instruments are marked according to obligatory identification system. Instrumentation equipment is checked before installation. After the end of the Pt catalyst campaign hard copy reports

are further held in the office of Head Deputy of the Plant until it reaches the age of 2 years after the issuance of the last ERUs. The electronic version reports are held in the EcoLogger computer located in the control room until it reaches the age of 2 years after the issuance of the ERUs.
After the end of the current month until the 5th day of the next month a summary of malfunctions, including daily maintenance and documentation book in Excel file in English for the last month is presented by the subsidiary Sistematika to the Head Deputy of the Plant. After the end of the current month until the 5th day of the next month Head Deputy shall send the following reviewed data to Vertis Environmental Finance (Vertis): Excel file of daily register and N2O monitoring data collect in EcoLogger system in Excel file. After the end Pt catalyst project campaign Head Deputy of the Plant shall send all project campaign data to Vertis in 10 days' period.
On the basis of N2O monitoring system data presented, entries in the daily register and daily maintenance and documentation book, Vertis shall perform N2O emission reduction calculations and shall prepare the monitoring report.

4.4.2 Findings

None

4.4.3 Conclusion

The project complies with the requirements.

5 PROJECT SCORECARD

Risk Areas		Conclusions			Summary of findings and comments
		Baseline Emissions	Project Emissions	Calculated Emission Reductions	
Completeness	Source coverage/ boundary definition	✓	✓	✓	All relevant sources are covered by the monitoring plan and the boundaries of the project are defined correctly and transparently.
Accuracy	Physical Measurement and Analysis	✓	✓	✓	State-of-the-art technology is applied in an appropriate manner. Appropriate backup solutions are provided.
	Data calculations	✓	✓	✓	Emission reductions are calculated correctly
	Data management & reporting	✓	✓	✓	Data management and reporting were found to be satisfying.
Consistency	Changes in the project	✓	✓	✓	Results are consistent to underlying raw data.

6 FIRST PERIODIC VERIFICATION STATEMENT

Bureau Veritas Certification has performed a verification of the JI project "ACHEMA UKL-7 plant N2O abatement project". The verification is based on the currently valid documentation of the United Nations Framework Convention on the Climate Change (UNFCCC).

The management of the Achema is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions of the project on the basis set out within the project Monitoring and Verification Plan indicated in the final PDD version 5. The development and maintenance of records and reporting procedures in accordance with that plan, including the calculation and determination of GHG emission reductions from the project is the responsibility of the management of the project.

Bureau Veritas Certification verified the Project Monitoring Report version 5 for the reporting period as indicated below. Bureau Veritas Certification confirms that the project is implemented as planned and described in validated and registered project design documents. Installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately. The monitoring system is in place and the project is generating GHG emission reductions.

Bureau Veritas Certification can confirm that the GHG emission reduction is calculated without material misstatements. Our opinion relates to the project's GHG emissions and resulting GHG emissions reductions reported and related to the valid and registered project baseline and monitoring, and its associated documents. Based on the information we have seen and evaluated we confirm the following statement:

Reporting period for Line 2: From 07/11/2008 to 12/10/2009 .
Emission Reductions : 170 043 t CO2 equivalents.

Reporting period for Line 3: From 04/07/2008 to 16/06/2009 .
Emission Reductions : 53 080 t CO2 equivalents.

Reporting period for Line 4: From 06/10/2008 to 28/04/2009 .
Emission Reductions : 53 774 t CO2 equivalents.

Reporting period for Line 5: From 02/07/2008 to 22/04/2009 .
Emission Reductions : 174 019 t CO2 equivalents.

Reporting period for Line 6: From 25/07/2008 to 21/04/2009 .
Emission Reductions : 114 364 t CO2 equivalents.

Reporting period for Line 7: From 03/07/2008 to 01/11/2009 .
Emission Reductions : 167 741 t CO2 equivalents.

Reporting period for Line 8: From 11/06/2008 to 20/11/2009 .
Emission Reductions : 80 546 t CO2 equivalents.

Reporting period for project Line2-Line8: From 17/05/2008 to 24/02/2009

Year 2008 Emission Reductions : 290 281 t CO2 equivalents;
Year 2009 Emission Reductions : 517 947 t CO2 equivalents;
Year 2010 Emission Reductions: 5 339 t CO2 equivalents;
Total: : 813 567 t CO2 equivalents.

7 REFERENCES

Category 1 Documents:
Documents provided by that relate directly to the GHG components of the project.

/1/ Project Design Document, version 5 dated 07 of September 2009.

/2/ Determination Report by Det Norske Veritas (DNV) No. 2008-086, version 02, dated 17 of September 2009.

/3/ Monitoring Report version 2.

/4/ Monitoring Report version 5.

/5/ CALCULATION MODEL, version 1, delivered for verification on 17 of April 2010

/6/ CALCULATION MODEL, version 2, delivered for verification on 14 April 2010

Category 2 Documents:
Background documents related to the design and/or methodologies employed in the design or other reference documents.

/7/ Documents checked during the verification onsite are presented in Annex C

Persons interviewed:
List of persons interviewed during the verification or persons that contributed with other information that are not included in the documents listed above.

/1/ Juozas Tunaitis, Technical director

/2/ Ramūnas Pilsudskas, Head of Nitric Acid plant

/3/ Tomas Krejaras, Nitric Acid plant deputy chief

/4/ Andrejus Šostakas, Head of Innovation Centre

/5/ Nijolė Mikutienė, Engineer of Technical Control department

/6/ Pakštys Stasys, Managing engineer, Instrumentation department

/7/ Stanislavas Rimavičius, Sector's engineer Subsidiary "Sistematika"

/8/ Ratmiras Vosylius, Automation engineer Subsidiary "Sistematika

/9/ Marius Staškevičius, Software engineer Subsidiary "Sistematika

/10/ Alfonsas Monkevičius, Automation technician, Subsidiary "Sistematika

/11/ Aušra Januškevičiūtė, Project Manager of Innovation Centre

APPENDIX A: VERIFICATION PROTOCOL

Table 1: Data Management System/Controls

The project operator's data management system/controls are assessed to identify reporting risks and to assess the data management system's/controls' ability to mitigate reporting risks. The GHG data management system/controls are assessed against the expectations detailed in the table. A score is assigned as follows:

- Full - all best-practice expectations are implemented.
- Partial - a proportion of best-practice expectations is implemented.
- Limited - this should be given if little or none of the system components are in place.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
1. Defined organisational structure, responsibilities and competencies	Full	
1.1. Position and roles Position and role of each person in the GHG data management process is clearly defined and implemented, from raw data generation to submission of the final data. Accountability of senior management must also be demonstrated.		Position and roles are defined in the JI MANUAL (approved by technical director on 03/03/2009) and referenced procedures: - N_2O monitoring system's troubleshooting procedure - List of spare devices, spare parts and utilities necessary for operation of UKL-7 1-8 units of N_2O monitoring system - Daily maintenance and documentation book - UKL-7 N_2O monitoring maintenance procedure in the scope of QAL3 procedure - N_2O monitoring maintenance schedule - List of devices applied in the monitoring system - Formulas applied in Foxboro system - Daily register of daily events in UKL-7plant - N_2O monitoring and documentation book - Responsibilities for maintenance JI project - Calibration plan of N_2O monitoring system related to the measuring equipment in UKL-7 nitric acid plant. The evidence of implementation of this JI MANUAL and referenced procedures has been proved and checked during the on-site audit. The majority of roles are performed by the staff supervising plant and monitoring equipment. Raw data are transferred to Vertis Environmental Finance which prepares the final N2O emission report and sends it to Achema. Senior management, represented by technical director Mr. Juozas Tunaitis, is responsible for JI project implementation and has clearly demonstrated accountability and awareness of senior management.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
1.2. Responsibilities Specific monitoring and reporting tasks and responsibilities are included in job descriptions or special instructions for employees.	Full	Comprehensive summary of the defined responsibilities is presented in the JI manual Annex 11 “Responsibilities for maintenance JI Project”. Also see 1.1 above.
1.3. Competencies needed Competencies needed for each aspect of the GHG determination process are analysed. Personnel competencies are assessed and training programme implemented as required.	Full	Necessary training for AMS maintenance personnel was performed by ECM ECO monitoring (this company had delivered and implanted AMS), also additional external ISO 14181 training was used. The technical consultant Mr. Daniel Domanovsky (representative of the Vertis Environmental Finance) has demonstrated high level competence of the JI monitoring and reporting requirements. There is no identified need for any specific training programmes at present.
2. Conformance with monitoring plan		
2.1. Reporting procedures Reporting procedures should reflect the monitoring plan content. Where deviations from the monitoring plan occur, the impact of this on the data is estimated and the reasons justified.	Partial	Excel based calculation tool „THE N2O EMISSION REDUCTION CALCULATION MODEL (CALCULATION MODEL) is developed to comply with methodology AM0034 for “Catalytic reduction of N2O inside the ammonia burner of nitric acid plants” and the monitoring plan. The tool’s operating principles are clearly described in the ACHEMA N_2O REDUCTION PROJECT EMISSION MODEL USER MANUAL (MODEL MANUAL)”. MODEL MANUAL and CALCULATION MODEL were analyzed to ensure that requirements of the AM0034 and Monitoring plan are fulfilled. The results of this analysis are described in the table below:

Requirement	Results
Determination of the permitted operating conditions of the nitric acid plant to avoid overestimation of baseline emissions	O.K.
Determination of baseline emission factor:	
- the monitoring system is to be installed using the European Norm 14181 (2004).	O.K.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)

- error readings (e.g. downtime or malfunction) and extreme values are to be automatically eliminated from the output data series by the monitoring system.	O.K.
$BE_{BC} = VSG_{BC} * NCSG_{BC} * 10^{-9} * OH_{BC}$	O.K.
$EF_{BL} = (BE_{BC} / NAP_{BC}) (1 – UNC/100)$	O.K.
- any N_2O baseline data that are measured during hours when the operating conditions are outside the permitted range must be eliminated from the calculation of the baseline emissions factor.	O.K.
- the baseline campaign is not valid and must be repeated if the plant operates outside the permitted range for more than 50% of the duration of the baseline campaign.	O.K.
-impact of regulations	CAR1
- the composition of the ammonia oxidation catalyst	O.K.
- campaign length	O.K.
- historic campaign length	O.K.
- baseline campaign length (CLBL)	O.K.
Project Emissions:	
- the monitoring system is to be installed using the guidance document EN 14181	O.K.
- error readings (e.g. downtime or malfunction) and extreme values are to be automatically eliminated from the output data series by the monitoring system.	O.K.
$PE_n = VSG * NCSG * 10^{-9} * OH$	O.K.
- derivation of a moving average emission factor	O.K.
- minimum project emission factor	O.K.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
		Emission reductions: $ER = (EF_{BL} - EF_P) * NAP * GWP_{N2O}$ — O.K. - the maximum value of NAP shall not exceed the design capacity — O.K. Approval of Integrated Pollution Prevention and Control (IPPC), issued on 30/04/2008, define limitations for N2O emissions: Year 2008: 8494,2 t Year 2009: 9266,4 t. AM0034 (page 7) requires to calculate EF_{reg} (emission level set by newly introduced policies or regulations (tN2O/tHNO3)), actually EF_{reg} is not calculated . **Corrective action request No 1:** Please, provide EFreg calculations in the monitoring report. If this regulatory limit is lower than the baseline factor, then the regulatory baseline shall be used for all calculations.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
2.2. Necessary Changes Necessary changes to the monitoring plan are identified and changes are integrated in local procedures as necessary.		The company has faced continuous malfunctions of the reflectometers to measure concentration of HNO3. Therefore, laboratory measured values of the nitric acid concentration are used for emission reduction calculations during these malfunction periods. The laboratory was visited during the audit and it was found that it had necessary equipment, methodologies and personnel to perform this test with sufficient reliability. However, AM0034 requires to measure HNO3 concentration daily. In fact, the laboratory has been performing this test with moving schedule (1 test per day for 1 line, therefore, test frequency is up to 9 days for each line). See CL2 and CL3. The PDD with “switch based“ N2O concentration measurement approach was determined positive. However, requirements for the measurement cycle were not defined in the PDD, therefore, this approach requires more clarification, see CL4. **Clarification action request No 1:** Please, justify why laboratory HNO3 concentration test frequency does not correspond to the requirements of AM0034 and prove using a conservative approach that lower testing frequency has not negatively impacted the reliability of N_2O emission reduction calculations. **Clarification action request No 2:** Please, define the requirements for laboratory HNO3 concentration measurements in case of reflectometers’ malfunction (including referenced sampling and test method, testing frequency, testing reporting). **Clarification action request No 3:** Please, provide information about the “switch based“ N_2O concentration measuring cycle (including measuring cycle changes during baseline and project campaigns) in the monitoring report and prove that additional uncertainty resulted by this was evaluated.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
3. Application of GHG determination methods		
3.1. Methods used There are documented descriptions of the methods used to determine GHG emissions and justification for the chosen methods. If applicable, procedures for capturing emissions from non-routine or exceptional events are in place and implemented.	Full	The AMS of Achema has a feature to apply a flag to every measured value of all covered parameters. The presence of a flag in the cell nearby the measured value is a condition to exclude the AMS measurement out of the calculation. In the Extreme Values Elimination Section (BaseLine and ProjectLine) these flags are taken into account in the algorithms determining the OK/E status of every measurement. For NAP, NCSG and VSG this automatically triggers the down of the AMS condition and the 4.5 rule. For values AFR, AIFR, OT, OP the AMS flagging excludes the value from the calculation and marks the operating hour as out of the permitted range. This approach is correctly implemented in the calculation model. Input of flags inside the model was randomly compared with records in the Daily event of UKL-7 book, no mismatches have been found.
3.2. Information/process flow An information/process flow diagram, describing the entire process from raw data to reported totals is developed.	Full	Information/process flow and data storage requirements are clearly described in the MODEL USER MANUAL and JI MANUAL.
3.3. Data transfer Where data is transferred between or within systems/spreadsheets, the method of transfer (automatic/manual) is highlighted - automatic links/updates are implemented where possible. All assumptions and the references to original data sources are documented.	Partial	The Excel file of daily event register and N2O monitoring data (all raw data) are collected in EcoLogger system in an Excel file. After the end of the project campaign the Head Deputy of the Plant sends all campaign data to Vertis Environmental Finance, they paste the data to CALCULATION MODEL. The CALCULATION MODEL is designed in such a way, that all automatic links are implemented inside the spreadsheet and the model performs emission reduction calculations automatically. All assumptions and the references to the original data sources are clearly demonstrated, e.g. monitoring data, calibration parameters, nameplate capacity, limit of the extreme values. **Corrective action request No 2:** Please, round up “Baseline emission factor” and “Project emission factor” in the CLACULATION MODEL sheet “Summary” to two digits after the comma. Without the rounding-up, the emission reduction data results declared in the monitoring report tables “T 1 Emission reduction calculations” do not correspond to the calculation results using formula. For example, see Line 2, Project campaign 1, Table “T 1 Emission reduction calculations”: (7,77-1,77)*12392*310=23049 (not 23041).

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
3.4. Data trails Requirements for documented data trails are defined and implemented and all documentation are physically available.	Full	All initial monitoring data are available and were presented for the audit. Also see 3.2 above.
4. Identification and maintenance of key process parameters		
4.1. Identification of key parameters The key physical process parameters that are critical for the determination of GHG emissions (e.g. meters, sampling methods) are identified.	Partial	All key parameters are identified in the MODEL USER MANUAL and subsequently in CALCULATION MODEL, except CL and CAR below: **Clarification action request No 4:** Please, explain in the monitoring report how stack gas water content is excluded from normalized stack gas mass flow value, because this calculation is not inside the CALCULATION MODEL and is not explained in the MODEL USER MANUAL. Please, provide evidence that stack gas water content measuring equipment is also calibrated. **Corrective action No 3:** Please, explain a change in the composition of the ammonia oxidation catalyst used in the baseline campaign to a composition other than that used in the previous five campaigns according to the requirements of AM0034. Please, also justify why parameters GS_{normal} and G_{normal} are not declared in the monitoring report. For example: for line 7 baseline campaign Heraeus catalyst was used, and for previous campaigns Johnson Matthey and Umicor were used. Project proponent has provided certificates that Johnson Matthey catalyst composition is 76Pt/4Rh/20Pd, Heraeus catalyst composition is 63/Pt/4Rh/33Pd, the composition of Umicor is not attached.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
4.2. Calibration/maintenance Appropriate calibration/maintenance requirements are determined.	Full	All the required metering systems have been installed as described in the PDD Annex 3. AMS consists of the N_2O concentration meter and integrated flow meter (flow, temperature, pressure measurements). According to the requirement of the AM0034/Version 02 methodology ASM should comply with the requirements of EN 14181. The European Norm EN 14181 stipulates three levels of quality assurance tests (QAL) and one annual functional test for Automated Measuring Systems which are recommended to be used as guidance regarding the selection, installation and operation of the Automated Measuring Systems under this Monitoring Methodology: 1. (QAL1). Application of tested Automated Measuring System (evaluation according to DIN EN ISO 14956). Calculation of Automated Measuring System uncertainty before installation according to EN ISO 14956. QAL 1 certificate for the AMS is issued on 13 July 2007 by MCerts (accredited by UKAS). QAL 1 certificate for the tail gas flow meter is issued on 16/10/2008 by TUVRheinland (accredited by DAR). 2. (QAL 2). Installation and Calibration of the Automated Measuring System according to the Standard Reference Measurement Method (SRM), determination of the measurement uncertainty/variability of the Automated Measuring System and inspection of the compliance with the prescribed measurement uncertainties. First QAL 2 test was carried out for the AMS on 21/11/2007-23/11/2008 by ARTEC (accredited by DAR), measuring equipment was found valid and data collecting system functional. AST test was repeated on 2008 (except for Line 1, 7, 8 which were not tested on 2008) and on 2009. The last AST report (2009 year) indicates that few measuring instruments did not pass the test (volume flow line 6, pressure line 3, and pressure line 6). AST failure on lines 3 and 6 does not have direct impact on the first periodic verification because the AST test was executed on July 21-24, 2009, while monitoring period for Line 3 ends on 16 June 2009 and on Line 6 on 21 April 2009. This issue will be verified in more detail during the next periodic verification. 3. (QAL 3). Continuous quality assurance through the local operator/manager (drift and accuracy of the Automated Measuring System, verification management and documentation). UKL-7 N_2O monitoring maintenance procedure in the scope of QAL3 is implemented effectively, including checking according to Shewart's and CUSUM schemes.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
		Other monitoring equipment is also controlled and calibrated according to these ACHEMA procedures: - calibration plan of N_2O monitoring system related to the measuring equipment in UKL-7 nitric acid plant - N_2O monitoring maintenance schedule - list of devices applied in monitoring system. Monitoring maintenance and calibration records were audited randomly (Line 2 and Line 7) and were found acceptable.
5. GHG Calculations		
5.1. Use of estimates and default data Where estimates or default data are used, these are validated and periodically evaluated to ensure their ongoing appropriateness and accuracy, particularly following changes to circumstances, equipment etc. The validation and periodic evaluation of this is documented.	Full	Constants, hard figures and switches that are used in the calculations are summarized In the CALCULATION MODEL's section SUMMARY table "Other assumptions" were verified and found acceptable.
5.2. Guidance on checks and reviews Guidance is provided on when, where and how checks and reviews are to be carried out, and what evidence needs to be documented. This includes spot checks by a second person not performing the calculations over manual data transfers, changes in assumptions and the overall reliability of the calculation processes.	Full	Vertis Environmental Finance is contracted to perform calculations using data provided by Achema, the data transferring process is described in JI MANUAL and is effectively controlled. CALCULATION MODEL implementation and control is performed by Vertis Environmental Finance, this review is not part of Achema JI MANUAL. **Forward action request No 1:** Please, define the requirements for the CALCULATION MODEL internal review and control (e.g. testing, formulas protection) needed to ensure the reliability of calculations with this tool.
5.3. Internal verification Internal verifications include the GHG data management systems, to ensure consistent application of calculation methods.	Partial	**Forward action request No 2:** It is recommended to include JI MANUAL into the ISO 9001 and ISO 14001 internal audit scope. Information for the management review might also include a comprehensive review of JI management system effectiveness, problem review and improvement recommendations.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
5.4. Internal validation Data reported from internal departments should be validated visibly (by signature or electronically) by an employee who is able to assess the accuracy and completeness of the data. Supporting information on the data limitations, problems should also be included in the data trail.	Full	Internal validation is broadly described in JI MANUAL section 2 “N2O emission measurement, data processing, storage, usage”. Supporting information (daily event log) is also included in the internal reporting and validation procedure.
5.5. Data protection measures Data protection measures for databases/spreadsheets should be in place (access restrictions and editor rights).	Partial	AMS electronic version reports are held and automatically backed-up in the EcoLogger computer located in the control room. **Forward action request No 3:** Please, document the requirements for access restrictions, editor rights control and back-up procedure (including back-up tests). **Forward action request No 4:** Please, define the storage place and retention period requirements for all JI electronic and paper documents/records mentioned in the JI manual, not only for AMS records.
5.6. IT systems IT systems used for GHG monitoring and reporting should be tested and documented.	Full	The performance of AMS software is checked by ECM ECO monitoring as part of the yearly AMD technical service.

Table 2: GHG calculation procedures and management control testing

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
Failure in data collection and management	Errors because of incorrect data input and management are possible.	Data transferring process is well designed and controlled, therefore the risk of failure in data collection and management is rather unlikely.
Failure of the monitoring equipment	Errors because of technical failure or insufficient calibration and maintenance are possible.	The AMS is controlled according to the requirements of the ISO 14181, other monitoring system equipment is also calibrated and controlled according to internal procedures. However, the risk to get unreliable monitoring data still exists in case of meter failure. E.g.: the ATS commissioning report issued by ECM ECO Monitoring, dated September 14th 2007, Includes problems which have resulted in the fact that N_2O concentration measurement data were missed from 04 September until 11 September 2007.
Errors in calculation	Errors because of wrong data input or false calculation model are possible.	The Monitoring report and CALCULATION MODEL were prepared by a consulting company Vertis Environmental Finance. However, errors are possible since this is the first monitoring report.

Table 3: Detailed audit testing of residual risk areas and random testing

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including *Forward Action Requests*)
Failure in data collection and management	1) Random audit to check if initial data are transferred to CALCULATION MODEL correctly.	Initial monitoring data were provided to the verifier. These data were compared with data in the CALCULATION MODEL (sheet „RAW DATA“). No mismatches have been found.
Unreliable monitoring data in case of meter failure	1) Random inspection of maintenance and calibration records (including requirements of ISO 14181 for QAL3 procedures). 2) Inspection of how procedures are operated in case of meter failure.	**Clarification action request No 6**: Due to AMS malfunction, mentioned in the commissioning protocol (04-11/09/2007), the AMS readings should be eliminated from the output data series (AMS was out of operation and these concentration measurement data were error readings). Please, justify why the AMS status in column Z is "TRUE" for 04 September until 11 September 2007 period (see Line 2, for example). Also see the verifier’s comments in Table 2, clause 11.2.
Errors in CALCULATION MODEL links and formulas	1) To check all CALCULATION MODEL formulas and assumptions to ensure that the model is designed according to AM0034 and monitoring plan requirements	There are no errors in CALCULATION MODEL, all assumptions are clear and meet the requirements of AM0034.

Table 4: Resolution of Corrective Action and Clarification Requests

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
Corrective action request No 1: Please, provide EF_{reg} calculations in the monitoring report. If this regulatory limit is lower than the baseline factor, then the regulatory baseline shall be used for all calculations.	Table 2, clause 2.1	Section on the EFreg calculation is included in the last section of the Monitoring Report version 5 "Comparison of the baseline emission factors against N2O mass limit in the IPPC permit".	Calculation of EFreg is used because IPCC permit define only N2O limit in tones, not it tones kgN2O/tHNO3. EFreg for is 8.06 kgN2O/tHNO3 and 8.16 kgN2O/tHNO3 for years 2008 and 2009 respectively. Baseline emission factor (7,62 kgN2O/tHNO3) is calculated using sumproduct approach, because IPCC permit limits do not define N2O emission level for each separate production line. Sumproduct baseline emission factor is lower than the regulatory emission factors and thus all actual measured baseline emission factors is used for calculation of emission reductions achieved. These approaches and calculation results is found acceptable, hence CR 1 is closed
Corrective action request No 2: Please, round up "Baseline emission factor" and "Project emission factor" in the CLACULATION MODEL sheet "Summary" to two digits after the comma. Without this rounding-up, the emission reduction data results declared in the monitoring report tables "T 1 Emission reduction calculations" do not correspond to the calculation results using formula. For example, see Line 2, Project campaign 1, Table "T 1 Emission reduction calculations": (7,77-1,77)*12392*310=23049 (not 23041).	Table 2, clause 3.3	Rounding is introduced into the model calculations (version 2) as requested.	Corrections has been verified and found acceptable, hence CAR2 is closed.

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
Corrective action request No 3: Please, explain a change in the composition of the ammonia oxidation catalyst used in the baseline campaign to a composition other than that used in the previous five campaigns according to the requirements of AM0034. Also please, justify why parameters GS_{normal} and Gn_{ormal} are not declared in the monitoring report. For example: for line 7 baseline campaign Heraeus catalyst was used, and for previous campaigns Johnson Matthey and Umicor were used. Project proponent has provided certificates that Johnson Matthey catalyst composition is 76Pt/4Rh/20Pd, Heraeus catalyst composition is 63/Pt/4Rh/33Pd, the composition of Umicor is not attached.	Table 2, clause 4.1	Tables T2 of monitoring report version 5 is updated so it lists now suppliers and compositions of primary catalysts during 5 historic campaigns. Selection of primary catalysts is determined by technical parameters of their use and price levels offered by suppliers in specific time. Primary catalysts used during the baseline campaign, if other than used in previous campaign/s, did not increase emissions of N2O as confirmed by relevant statements provided to the verifier.	Composition of the some primary catalyst gauzes is still not available because suppliers treat it as know-how. However, provided statements of the primary catalyst suppliers (Johnson Matthey, Umicor, Heraeus) is found acceptable, hence CAR 3 is closed.
Corrective action request No 4: Please, provide at least one written project approval by a Party involved in the JI project, other than the host Party(ies) before submitting the first verification report for publication. See requirements in the http://ji.unfccc.int/Ref/Documents/Glossary_JI_terms.pdf.		Project approval from Investor party was provided, issued by Ministry of the Economic Affairs, NL Agency NL Energy and Climate Change on 01/06/2010.	CAR 4 is closed.
Clarification action request No 1: Please, justify why laboratory HNO3 concentration test frequency is not according to AM0034 and prove using a conservative approach that lower testing frequency has not negatively impacted the reliability of N_2O emission reduction calculations.	Table 2, clause 2.2	Methodology does not define the HNO3 concentration measurement frequency, but HNO3 production recording frequency, which is daily. HNO3 production calculation is Achema measures the HNO3 concentration by refractometers on hourly basis and by laboratory analysis on a weekly basis, which is the usual industry standard. As described in the PDD Monitoring Plan, Achema uses besides laboratory analysis also the refractometers HNO3 production measurement. Laboratory	HNO3 concentration measurements are consistent part of the HNO3 production calculation, therefore concentration measurement results on weekly basis might be not sufficiently reliable. This clarification action request is closed taking into account that concentration is quite stabile and average deviation is low. However, see FAR 5 below.

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
		measurements provide somewhat higher nitric acid production data than refractometers measurements and thus the project uses, in line with the JI projects spirit of conservativeness, the lower of two equally acceptable measurement methods, i.e. refractometers measurements. Laboratory measurements are used only for calculation of the nitric acid production during defined periods of time, when refractometers were out of operation due to their malfunctions (mainly in 2008 year). During the year 2008 there were approx. 150 laboratory measurements done in order to replace the missing refractometers measurements (when devices were sent for inspection and repair to their manufacturer) and difference between totally lowest (54.7%) and totally highest (59.8%) HNO3 concentration measured in laboratory on weekly basis over the entire year was just 5.1% with average deviation 0.66% between weekly measurements. Weekly periodicity is usual industry standard. Details of the measurement procedure are described below in the response to the CR 2.	
Clarification action request No 2: Please, define the requirements for laboratory HNO3 concentration measurements in case of reflectometers' malfunction (including referenced sampling and test method, testing frequency, testing reporting).	Table 2, clause 2.2	In case of refractometer's malfunction the HNO3 concentration is measured in laboratory.	Generally explanation is acceptable, actually problem is that monitoring plan do not provide requirements how to measure

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
		The sample point of nitric acid production is in the output of the aggregate – in the pipe after the bleaching column. In the laboratory HNO3 concentration is tested by titration method. This method is defined in the company's standard (No.IST 5666739-32:2002) of nitric acid production. The laboratory controller, who performs the testing, is trained according "Training program for laboratory assistant performing chemical analysis"," Toxic chemical goods worker training program" and has qualification of chemistry's laboratory assistance. Until 2010 year the testing frequency was once a week. This periodicity is usual in Achema and it is also the usual industry practice. Since 2010 year the testing frequency is once a day during the period of refractometers malfunction. The laboratory NAC results are recorded in the laboratory registers No.Z42-303-40/303/08 and No.Z14-303-40/303/08. From laboratory registers NAC data are inputted in to Excel sheet manually.	HNO3 concentration in case of reflectometers failure. To ensure completeness of the monitoring requirements FAR 5 is issued: FAR 5: Please define the requirements for laboratory HNO3 concentration measurements in case of reflectometers' malfunction in revised monitoring plan, and submit it for the determination by the accredited independent entity until the next verification.
Clarification action request No 3: Please, provide information about the "switch based" N_2O concentration measuring cycle (including measuring cycle changes during baseline and project campaigns) and prove that the resulted additional uncertainty was evaluated.	Table 2, clause 2.2	N2O monitoring system has 3 analysers for 8 lines: 1st analyzer measures 1, 2 and 3	Information is found acceptable, hence CL3 is closed. To ensure completeness of the monitoring requirements FAR 6 is

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
		lines. 2nd analyzer measures 4, 5 and 6 lines. 3rd analyzer measures 7 and 8 lines. Switching between lines is managed by the AMS software. Switching intervals between lines are 300 seconds (5 minutes). 60 seconds (1 minute) of 300 seconds are for purging, i.e. no measurement during that time. Next 240 seconds (4 minutes) are for measuring, i.e. AMS is registering N2O concentration values of selected line. 1st analyser complete 15 minutes measuring cycle, 1 minute purging, 4 minutes measuring fore earch line measured line (1,2,3). 2st analyser complete 15 minutes measuring cycle, 1 minute purging, 4 minutes measuring fore earch line measured line (4,5,6). 3st analyser complete 10 minutes measuring cycle, 1 minute purging, 4 minutes measuring fore earch line measured line (7,8). Emission values are product of	issued: FAR 6: Please describe details of the „switch based“ HNO3 N_2O concentration measuring cycle in the monitoring plan in revised monitoring plan, and submit it for the determination by the accredited independent entity until the next verification.

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
		operating hours, mean of the hourly measurements N2O concentration, mean of the hourly measured VSG. BE = OH * mean(NCSG) * mean(VSG) The additional uncertainty comes from the additional deviation of mean(NCSG) in the equation, that stems from lower sampling rate. We calculate the deviation of mean(NCSG) under 2 sec sampling intervals, as well as the actual, and take the difference. The deviation of mean(NCSG) depends on deviation of the hourly measurements, sample size, number of measurements: stdev(mean("Actual hourly NCSG")) = stdev("Actual hourly NCSG") / sqrt("OH of NCSG measurement"), where OH is the number of hours (or observations) that are taken into account in the calculation of NCSG, that are not eliminated due to various reasons (like short project campaign, etc). Actual means the number we have with under-sampling. The hourly NCSG values we receive are in fact the averaged values of NCSG readings collected on a 2	

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
		seconds interval. Had we sampled every 2 seconds, we would have 1800 samples per hour. In case of two lines on the same device (with 4 minutes measurement, 1 minute of purge time), we have 720 samples per hour (or 480 in case of 3 lines per device). “sample size” = “logging interval time” / ((“measurement time” + “switching time”) * “no. of lines”) * “measurement time” / “sampling interval time”. We can estimate the deviation of the second level NCSG measured by the device from the deviation of the hourly samples by taking into account the sample size and that they are the average of the second level readings. From this we can calculate what would be the deviation of the hourly NCSG in case we had a full sampling rate. stdev(“Actual hourly NCSG”) = stdev(“Second level NCSG”) / sqrt(“Actual sample size”) stdev(“Ideal hourly NCSG”) = stdev(“Second level NCSG”) / sqrt(“Ideal sample size”)	

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
		or stdev("Ideal hourly NCSG") = stdev("Actual hourly NCSG") * sqrt("Actual sample size") / sqrt("Ideal sample size") Afther that, we take into account the OH of the NCSG measurement to get the ideal deviation of the mean of the hourly values under normal sampling. stdev(mean("Ideal hourly NCSG")) = stdev("Ideal hourly NCSG") / sqrt("OH of NCSG measurement") The additional uncertainty is the difference between the ideal and the under-sampled deviation of the mean of the hourly values. Diff = stdev(mean("Actual hourly NCSG")) - stdev(mean("Ideal hourly NCSG")) Combined UNC = sqrt(UNC^2 + Diff^2) Where UNC is the QAL2 uncertainty.	
Clarification action request No 4: Please, explain in the monitoring report how stack gas water content is excluded from normalized stack gas mass flow value, because this calculation is not inside the CALCULATION MODEL and is not explained in the MODEL USER MANUAL. Please, provide evidence that stack gas	Table 2, clause 4.1	Treatment of the stack gas water content is explained in monitoring report version 5 on pages 14 and 15. Steam F, T and P meter calibration passports is provided to verification	Explanation and calibration records is found acceptable, hence CR 4 is closed. However, requirements of stack water content treatment is missing in the monitoring plan,

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
water content measuring equipment is also calibrated.		team.	therefore FAR 7 is issued with request to revise monitoring report accordingly. FAR 7: Please define requirements of the stack gas water measurments and exlusion from normalized stack gas mass flow value in the monitoring plan in revised monitoring plan, and submit it for the determination by the accredited independent entity until the next verification.
Clarification action request No 5: Please, explain a change in the composition of the ammonia oxidation catalyst used in the baseline campaign to a composition other than that used in the previous five campaigns according to the requirements of AM0034. Also please, justify why parameters GS_{normal} and G_{normal} are not declared in the monitoring report. For example: for line 7 baseline campaign Heraeus catalyst was used, and for previous campaigns Johnson Matthey and Umicor were used. Project proponent has provided certificates that Johnson Matthey catalyst composition is 76Pt/4Rh/20Pd, Heraeus catalyst composition is 63/Pt/4Rh/33Pd, the composition of Umicor is not attached.	Table 2, clause 4.1	1st response: Use of different primary catalysts in terms of their supplier and their composition is allowed by the methodology and it represents business as usual scenario in nitric acid plants across the world and especially in type of nitric acid plants like the Achema UKL-7, where 8 lines falling under the scope of the JI project are operated. Different composition of the FTC is caused by addition of additional layers serving for the precious metal catchment and recovery. This addition has no impact on the level of the N2O formation. This issue has been discussed and positively determined by the DNV, which had not raised any objections to this usual practice in Achema in its final determination report (conclusion to the CR4 of the Determination report on its page A-32) and this	1st conclusion: Actually, DNV has transferred responsibility to the verifier, see final sentence of CR4: "The final verification of the permitted ranges, the normal campaign length and catalyst installed are subject to be finally verified by the verifying DOE. Therefore please provide composition of the catalyst in the monitoring report Tables T2 with reference to certificate date or number. If catalyst suppliers have not provided information on composition, please indicate this in this Table. Please prove statement that different composition has no impact on the level of the N2O formation by literature or supplier documentation or catalogues. Final conclusion: statements of the primary catalyst suppliers (Umicore,

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
		approach has been positively determined "also in case of other projects. This approach is also in line with the CDM AM0034 methodology “(i) The baseline catalyst composition is considered as common practice in the industry” and “(ii) The change in catalyst composition is justified by its availability, performance, relevant literature”. Parameters of primary catalyst suppliers during 5 historic campaigns can be found in tables T2 of the monitoring report and information on their compositions was provided to the determinator during the determination stage and also to the verifier in the verification stage. Some primary catalyst suppliers treat information on composition of their primary catalyst as confidential information and thus this information is provided directly to the verifier only. Regarding the Umicore composition this figure can be found in the certificate provided, which states that MKS modular katalysator system TM is made of Pt/Rh 95/5 %. 2nd response:	Johnson Matthey, Heraeus) was reviewed. Supliers stated that primary catalyst used do not increase N2O emission level in normal operating conditions. Therefore CL5 is closed, despite that composition of primary catalyst used is still not available for all primary catatyst gauzes (in some cases suppliers treats this information as know-how and are not ready to disclose it).

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
		Requested statements of the primary catalyst supliers (have been provided to verification team. Monitoring report tables 2 has been updated.	
Clarification action request No 6: Due to AMS malfunction, Due to AMS malfunction, mentioned in the commissioning protocol (04-11/09/2007), the AMS readings should be eliminated from the output data series (AMS was out of operation and these concentration measurement data were error readings). Please justify why the AMS status in column Z is "TRUE" for 04 September until 11 September 2007 period (see Line 2, for example).	Table 3	Emission reductions calculation model has been updated and it reflects now all AMS malfunction occurrences as recorded in the Achema UKL-7 maintenance book.	Calculation model version 2 was verified and no related mistakes or misstatements were not found. Therefore CR 6 is closed.
Forward action request No 1: Please, define the requirements for the CALCULATION MODEL internal review and control (e.g. testing, formulas protection) needed to ensure the reliability of calculations with this tool.	Table 2, clause 5.2	Emission reductions calculation model has been develop by Vertis emission reductions calculation model expert Laszlo Pasztor. Model was reviewed by two other Vertis experts Ivo Petrov and Akos Farkas. Model was subject also to the initial verification which had concluded the positive assessment of the Model in its section G.6 (CAR 1 and CAR 2 included in the assessment of the G.6 section has been already settled during the initial verification stage). Model has been also used (taking into account project specifics as the case may be) for other JI project which has passed positively the first periodic verification stage. Locking the emission reductions calculation model is not practical and it does not increase integrity of emission data. Furthermore, JISC does not accept calculation models protected by passwords.	FAR is regarding CALCULATION MODEL testing and control in order to prevent accident changes in MODEL and formulas, not access passwords. Please define requirements how you ensure that model will not be changed or damaged incidentally in the future. External verification is not intended to change internal control (objective of internal control is to minimize risk of errors and misstatements). This FAR will be verified during second periodic verification.
Forward action request No 2: It is recommended to include JI	Table 2, clause 5.3	In the nitric acid plant internal auditors	This FAR will be verified during

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
MANUAL into the ISO 9001 and ISO 14001 internal audit scope. The information for the management review might also include a comprehensive review of JI management system effectiveness, problem review and improvement recommendations.		do internal audits of nitric acid manufacturing managing according standards ISO 9001 and ISO 14001 once per year. In to the scope of both audits will be included review of JI management according JI MANUAL BI-122-02.	second periodic verification.
Forward action request No 3: Please, document the requirements for access restrictions, editor rights control and back-up procedure (including back-up tests).	Table 2, clause 5.5	Emission data access restrictions, editor rights and back-up procedures are described in the AMS software configuration manuals attached. This setup of the AMS software allows storing all raw data required and transparently executing all further data calculations (including the QAL2 adjustments and AM0034 calculations) in the emission reductions calculation model. We have updated the JI manual. Software description and use guidelines are included into Chapter 6 of JI Manual "List of main documents used for JI project".	This FAR will be verified during second periodic verification.
Forward action request No 4: Please, define the storage place and retention period requirements for all JI electronic and paper documents/records mentioned in the JI manual, not only for AMS records.	Table 2, clause 5.5	JI manual is updated accordingly.	Revised JI manual is reviewed and found acceptable, hence FAR4 is closed. But please register this change in the JI manual's "sheet for registrations of revisions"
Forward action request No 5:: Please define the requirements for laboratory HNO3 concentration measurements in case of reflectometers' malfunction in revised monitoring plan, and submit it for the determination by the accredited independent entity until the next verification			This FAR will be verified during second periodic verification.
Forward action request No 6:: Please describe details of the „switch based" HNO3 N_2O concentration measuring cycle in the monitoring plan in revised monitoring plan, and submit it for the			This FAR will be verified during second periodic verification.

Report clarifications and corrective action requests	Reference to checklist question	Summary of project owner response	Verification conclusion
determination by the accredited independent entity until the next verification.			
Forward action request No 7:: Please define requirements of the stack gas water measurements and exclusion from normalized stack gas mass flow value in the monitoring plan in revised monitoring plan, and submit it for the determination by the accredited independent entity until the next verification.			This FAR will be verified during second periodic verification.

APPENDIX B: VERIFICATION TEAM

The verification team consists of the following personnel:

Nadiia Kaiun, M.Sci. (environmental science)
Team Leader, Lead Verifier

Bureau Veritas Lithuania

Graduated from National University Kyiv-Mohyla Academy with the Master Degree in Environmental Science. She is a Lead auditor of Bureau Veritas Certification for Environment Management System (IRCA registered). She performed over 15 audits since 2008. She has undergone intensive training on Clean Development Mechanism /Joint Implementation and she is involved in the validation of 9 JI projects.

Tomas Paulaitis, M.Sci. (chemical engineering)
Verifier
Bureau Veritas Lithuania
Tomas Paulaitis is a lead auditor for the environment and quality management systems and a lead GHG verifier (EU ETS, JI) with over 10 years of experience and was/is involved in the determination/verification of 8 JI projects.

Report was reviewed by:

Ashok Mammen

Bureau Veritas Certification Internal reviewer
Over 20 years of experience in chemical and petrochemical field. Dr. Mammen is a lead auditor for environment, safety and quality management systems and a lead verifier for GHG projects. He has been involved in the validation and verification processes of more than 60 CDM/JI and other GHG projects

APPENDIX C: DOCUMENTS CHECKED DURING VERIFICATION

1. JI manual BI-122-2 UKL-7 plant
2. IPCC permit
3. Operating manual
4. Monitoring system commissioning protocol
5. Monitoring system training records
6. Monitoring system spare parts list
7. Monitoring system data processing description
8. QAL1 certificates
9. QAL2 report
10. AST report 2008
11. AST report 2009
12. QAL3 manual
13. Secondary catalysts loading protocols
14. Primary catalysts loading protocols
15. JI responsibilities English version
16. JI responsibilities Lithuanian version
17. JI procedures manual
18. QAL3 procedures
19. Emergency procedures
20. Monitoring system supervision procedures
21. Internal audit procedures
22. HNO3 concentration laboratory measurement records
23. Calibration instructions and records
24. CUSUM charts
25. Primary catalyst suppliers statements