VERIFICATION / CERTIFICATION REPORT

PROJECT FOR THE CATALYTIC REDUCTION OF N2O EMISSIONS WITH SECONDARY CATALYST INSIDE THE AMMONIA REACTOR OF THE NO. 9 NITRIC ACID PLANT AT AFRICAN EXPLOSIVES LTD ("AEL"), SOUTH AFRICA

(UNFCCC Registration Ref. No. 1171)

Monitoring Period:
5 August 2009 to 1 July 2010

REPORT NO. 2011-1256
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VERIFICATION / CERTIFICATION REPORT

Date of first issue: 30 August 2012	Project No.: PRJC-277994-2010-CCS-NOR
Approved by Trine Kopperud	Organisational unit: DNV KEMA Energy & Sustainability, Accredited Climate ChangeService
Client: African Explosives Ltd	Client ref.: Hendrik Burger

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Summary:

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions reported for the "Project for the catalytic reduction of N2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa" (UNFCCC Registration Ref. No. 1171) for the period 5 August 2009 to 1 July 2010.

In our opinion, the GHG emission reductions reported for the project in the monitoring report (Version 05) of 28 August 2012 are fairly stated.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology AM0034 (version 02) and the monitoring plan contained in the Project Design Document of 5 April 2007.

DNV Climate Change Services AS is able to certify that the emission reductions from the "Project for the catalytic reduction of N2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa" during the period 5 August 2009 to 1 July 2010 amount to 57 345tonnes of CO_2 equivalent.

Report No.: 2011-1256	Subject Group: Environment

Report title:

Project for the catalytic reduction of N_2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa

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Abbreviations

AEL	African Explosives Ltd.
AFR	Ammonia gas flow rate to the ammonia oxidation reactor
AIFR	Ammonia to air ratio into the oxidation reactor
AMS	Automated Measuring System
AOR	Ammonia oxidation reactor
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
EF	Emission factor
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
N_2O	Nitrous oxide
OP	Oxidation pressure
OT	Oxidation temperature
PDD	Project Design Document
QAL1	One of the Quality Assurance Levels defined by EN 14181:2004 “Stationary source emissions – quality assurance of automated measuring systems”
QAL2	One of the Quality Assurance Levels defined by EN 14181:2004 “Stationary source emissions – quality assurance of automated measuring systems”
QAL3	One of the Quality Assurance Levels defined by EN 14181:2004 “Stationary source emissions – quality assurance of automated measuring systems”
QMS	Quality Management System
SRM	Standard Reference Method
UNFCCC	United Nations Framework Convention on Climate Change

1 INTRODUCTION

African Explosives Ltd has commissioned DNV Climate Change Services AS (DNV) to carry out the verification and certification of emission reductions reported for the "Project for the catalytic reduction of N2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa" (the project) in the period 5 August 2009 to 1 July 2010. This report contains the findings from the verification and a certification statement for the certified emission reductions.

1.1 Objective

Verification is the periodic independent review and *ex post* determination by a Designated Operational Entity (DOE) of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM project activity during a defined monitoring period.

Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the "Project for the catalytic reduction of N2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa" for the period 5 August 2009 to 1 July 2010.

1.2 Scope

The scope of the verification is to verify that:

- The project activity has been implemented and operated in accordance with the registered PDD or any approved revised PDD;
- The monitoring plan complies with the monitoring methodology and the actual monitoring complies with the monitoring plan, including compliance with any guidance provided by the Board regarding deviations from the provisions of a registered plan and/or methodology;
- The data and calculation of GHG emission reductions have been assessed to correctly support the emission reductions being claimed.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified.

The verification team has based the verification on the recommendations in the Validation and Verification Manual version 0.1.2 /28/.

1.3 Description of the Project Activity

Project Parties: *South Africa and United Kingdom of Great Britain and Northern Ireland. Switzerland*

Title of project activity:	*Project for the catalytic reduction of N2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"),* South Africa
UNFCCC registration No:	*1171*
Baseline and monitoring methodology	*AM0034 (version 02)*
Project Participants:	*African Explosives Ltd.; N.serve Environmental Services Gmbh.*
Location of the project activity:	*Modderfontein, Province of Gauteng, South Africa.*
Project's crediting period:	*05 November 2007 to 04 November 2017*
Period verified in this verification:	*5 August 2009 to 1 July 2010*

The project activity involves the installation of a secondary N_2O catalyst inside the ammonia oxidation reactor (burner) just beneath the precious metal catalyst gauze catalyst. The N_2O catalyst is selective and promotes the decomposition of N_2O to nitrogen and oxygen. Secondary abatement technologies will normally reduce the emissions by 70-90%.

The emission reductions reported from the project for the period from 5 August 2009 to 1 July 2010 amounts to 57 345 tonnes of CO_2 equivalent.

1.4 Methodology for Determining Emission Reductions

The emission reductions for the project activity over a specific campaign are 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 N_2O. The nitric acid production for the project campaign ($tHNO_3$), NAP, shall not exceed the design capacity.

The baseline emission factor is determined ex-ante, and may necessarily be re-calculated when a project campaign is shorter than the historical campaign length and baseline campaign length. The flow-rate of stack gas, the concentration of N_2O in the stack gas, the operation hours, and the production output of 100% concentrated nitric acid need to be monitored, to calculate the campaign-specific emission factor and the emission reductions for a specific campaign. The emission reductions for a verification period are the sum of emission reductions for each campaign within the verification period.

According to the AM0034, version 02, the emission reductions for the project activity over a specific campaign are 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 N_2O as follows:

$$ER = (EF_{BL} - EF_P) * NAP * GWP_{N2O} \quad (tCO_{2e})$$

Where:

ER	Emission reductions of the project for the specific campaign (tCO_2e)
NAP	Nitric acid production for the project campaign ($tHNO_3$). The maximum value of NAP shall not exceed the design capacity.

EF_{BL}	Baseline emissions factor ($tN_2O/tHNO_3$)
EF_P	Emissions factor ($tN_2O/tHNO_3$) used to calculate the emissions from this particular campaign (i.e. the higher of $EF_{ma,n}$ and EF_n) – see below
GWP_{N2O}	Global warming potential of N_2O = 310

The average mass of N_2O baseline emissions per hour is estimated as product of the NCSG and VSG after applying statistical process as per the methodology requirements. The N_2O emissions per campaign are estimates product of N_2O emission per hour and the total number of complete hours of operation of the campaign using the following equation:

$$BE_{BC} = VSG_{BC} * NCSG_{BC} * 10^{-9} * OH_{BC} \quad (tN_2O)$$

The plant specific baseline emissions factor representing the average N_2O emissions per tonne of nitric acid over one full campaign is derived by dividing the total mass of N_2O emissions by the total output of 100% concentrated nitric acid for that period. The overall uncertainty of the monitoring system is determined and the measurement error is expressed as a percentage (*UNC*). The N_2O emission factor per tonne of nitric acid produced in the baseline period (EF_{BL}) shall then be reduced by the estimated percentage error as follows:

$$EF_{BL} = (BE_{BC} / NAP_{BC}) (1 – UNC/100) \quad (tN_2O/tHNO_3)$$

where:

EF_{BL}	Baseline N_2O emissions factor ($tN_2O/tHNO_3$)
BE_{BC}	Total N_2O emissions during the baseline campaign (tN_2O)
$NCSG_{BC}$	Mean concentration of N_2O in the stack gas during the baseline campaign (mgN_2O/m^3)
OH_{BC}	Total number of operating hours of the baseline campaign (h)
VSG_{BC}	Mean gas volume flow rate at the stack in the baseline measurement period (m^3/h)
UNC	Overall uncertainty of the monitoring system

The average mass of N_2O project emissions per hour is estimated as product of the NCSG and VSG. The N_2O emissions per campaign are estimates product of N_2O emission per hour and the total number of complete hours of operation of the campaign using the following equation:

$$PE_n = VSG * NCSG * 10^{-9} * OH \quad (tN_2O)$$

where:

VSG	Mean stack gas volume flow rate for the project campaign (m^3/h)
NCSG	Mean concentration of N_2O in the stack gas for the project campaign (mgN_2O/m^3)
PE_n	Total N_2O emissions of the nth project campaign (tN_2O)
OH	The total number of operation hours of the project campaign (h)

A campaign specific emissions factor is calculated by dividing the total mass of N_2O emissions during that campaign by the total production of 100% concentrated nitric acid during that same campaign as follows:

$$EF_n = PE_n / NAP_n \quad (tN_2O/tHNO_3)$$

In order to take into account possible long-term emissions trends over the duration of the project activity and to take a conservative approach a moving average emission factor is estimated as follows:

$$EF_{ma,n} = (EF_1 + EF_2 + \ldots + EF_n) / n \quad (tN_2O/tHNO_3)$$

To calculate the total emission reductions achieved in a campaign, the higher of the two values $EF_{ma,n}$ and EF_n is applied as the emission factor relevant for the particular campaign to be used to calculate emissions reductions (EF_p) in equation given for ER above. Thus:

If $EF_{ma,n} > EF_n$ then $EF_p = EF_{ma,n}$
If $EF_{ma,n} < EF_n$ then $EF_p = EF_n$

Further a campaign-specific emissions factor shall be used to cap any potential long-term trend towards decreasing N_2O emissions that may result from a potential built up of platinum deposits. After the first ten campaigns of the crediting period of the project, the lowest EF_n observed during those campaigns will be adopted as a minimum (EF_{min}). If any of the later project campaigns results in a EF_n that is lower than EF_{min}, the calculation of the emission reductions for that particular campaign shall used EF_{min} and not EF_n As 10 project campaigns are not yet completed this is not applicable to this verification period.

In AM0034 version 2 no leakage calculation is required.

2 METHODOLOGY

DNV has assessed and determined that the implementation and operation of the project activity, and the steps taken to report emission reductions comply with the CDM criteria and relevant guidance provided by the Board. The verification team has conducted the verification based on the recommendation in the Validation and Verification Manual /28/.

The verification process includes desk review of the monitoring report published (and any updated versions), emission reduction calculation spread sheets and other supporting documents and data. Further, onsite assessments and interviews with those involved in project management and operations are conducted. This follows preparation of draft verification report summarizing desk review and on-site assessment findings (i.e. CARs, CLs, and FARs). Upon successful closing of the CARs and CLs raised, the final verification report is prepared. The final report then undergoes a technical review, and final approval according to DNV's internal quality assurance procedures.

2.1 Verification Team

The verification team and their roles and involvement in the verification process are provided in the following table:

Verification team

Role	***Last Name***	***First Name***	***Country***	***Type of involvement***					
				Desk review	Site visit	Reporting	Supervision of work	Technical review	TA 5.1 competence
Team leader (Verifier)	Andrtová	Zuzana	Czech Republic	✓	✓	✓	✓		
Expert	Berge	Torkjell	Norway	✓	✓				✓
Verifier	Massicard	Patrice	Norway			✓			
Technical reviewer	Khawaja	Rafi-ud-Din	Norway					✓	✓

Duration of verification

Monitoring report publication *29 November 2010*

Preparations: *7 December 2010*

On-site verification: *14 December 2010*

Reporting, calculation checks and QA/QC*: 6 January 2011 to 30 August 2012*

2.2 Review of Documentation

The monitoring report for 3rd period /1/ with two spreadsheets to document emission reduction calculation and raw data transformation to final data file /2/ were basis of desk review. These documents were presented to DNV as first version dated 25 November 2010 and they have been revised in response to findings from the verification site visit.
Supporting documents were the registered PDD version 2.0 dated 5 April 2007 /3/, its validation report developed by TÜV SÜD /23/ and previous verification reports developed by DNV /7//8/. All these documents (except previous verification reports /7//8/) are publicly available on UNFCCC website. Basis for document review were also the approved baseline and monitoring methodology applied by the project, AM0034, version 02 /27/ and its clarification by EB /32/.
Calibration certificates for monitoring equipments /4/~/6//14//17//18/, catalyst documentation /22/, plant management procedure /16/ and operational records were presented by project participant during the site visit.
Further part of reviewed documents was relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board.

During the desk review, DNV has applied standard auditing techniques to assess the quality of information provided. The following activities were performed:

- A review of the data and information presented to verify their completeness;
- A review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures; and
- An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

2.3 Site Visits

A site visit was carried out 14 December 2010, and the key personnel at African Explosives Ltd and N.serve Environmental Services GmbH were interviewed or assisted the verification team /35/~/39/.

During the on-site assessment, the following aspects of the CDM project activity have been confirmed:

- The implementation and operation of the CDM project activity;
- The information flow for generating, aggregating and reporting of the monitoring parameters; and
- The operational and data collection procedures are implemented in accordance with the monitoring plan in the PDD.

Further, the following activities were performed:

- A cross-check between information provided in the monitoring report and data from other sources such as production logs;
- A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD and the selected methodology;
- Local laboratory procedures relevant for the project
- A review of calculations and assumptions made in determining the GHG data and emission reductions; and
- An identification that quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

This has enabled the verification team to assess the accuracy and completeness of reported monitoring results; to verify the correct application of the approved monitoring methodology AM0034, version 02 /27/ and the determination of the emission reductions.
Summary, the data presented in the monitoring report /1/ were assessed by review of the detailed project documentation and production records and by interviews with personnel at African Explosives Ltd and N.serve Environmental Services GmbH, and observation of collection of measurements, observation of established monitoring and reporting practices and assessment of the reliability of monitoring equipment. This has enabled the verification team to assess the accuracy and completeness of reported monitoring results; to verify the correct

application of the approved monitoring methodology and the determination of the emission reductions.

In addition all parameters required by the monitoring methodology AM0034, version 02 /27/, and the management system were assessed during the site visit.

2.4 Reporting of Findings

A corrective action request (CAR) is issued, where:

i. Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
ii. Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
iii. Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

A clarification request (CL) shall be raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is issued for actions if the monitoring and reporting require attention and/or adjustment for the next monitoring period.

Four CARs, two CLs and three FARs were identified during this verification. All CARs, CLs and two FARs were correctly addressed during this verification. One FAR remains open and will be verified during the next verification.

3 VERIFICATION FINDINGS

This section summarises the findings from the verification of the emission reductions reported for the "Project for the catalytic reduction of N2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa" for the period 5 August 2009 to 1 July 2010.

3.1 Remaining Issues, CARs, FARs from Previous Validation or Verification

One FAR was open from previous verification /8/. This FAR related to data handling from production logs to the excel sheet of operational data has been closed during this verification. DNV observed the handling routine during the site visit as well as reviewed the relevant procedure for data handling /16/. For more details see appendix A.

3.2 Project Implementation

As per para 198 (a) of VVM version 01.2 /28/, DNV verified that the project is implemented in accordance with the description contained in the registered PDD of 5 April 2007 /3/. The verification team confirmed, through visual inspection that all physical features of the proposed CDM project activity including data collection systems and storage have been implemented in accordance with the registered PDD. As per para 198 (b) of VVM version 1.2, DNV confirmed during the on-site visit that the CDM project is completely operational.

The baseline campaign (AEL campaign no H15) was operated from 5 September 2007 to 6 November 2007. As confirmed in the validation report /23/, the data from the baseline campaign were not verified by the validating DOE, and the confirmation of the baseline campaign data to be used for ex-post emission reduction calculations was included in the scope of the verifying DOE. Thus the baseline campaign was verified by DNV during the first verification period simultaneously with first project's campaigns /7/. The project was registered on 5 November 2007, which is also the start date of the crediting period, and the first campaign with secondary catalyst installed (H16) started on 9 November 2007. The project campaigns verified in previous verifications are presented below:

Campaign No. (AEL No)	Duration of the campaign
1. Campaign (H16)	9 November 2007 – 09 February 2008
2. Campaign (H17)	19 February 2008 – 12 June 2008
3. Campaign (H18)	8 July 2008 – 28 July 2008
(H19-H22)	Intermediate campaigns without secondary catalyst
4. Campaign (H23)	25 February 2009- 04 August 2009

The 3rd verification period from 5 August 2009 to 1 July 2010 covers three project campaigns, as presented below in tabular form:

Campaign No. (AEL No)	Duration of the campaign
5. Campaign (H24)	5 August 2009 – 1 November 2009
6. Campaign (H25)	30 November 2009 – 7 March 2010
7. Campaign (H26)	8 April 2010 – 1 July 2010

The primary catalyst installed for the ammonia oxidation is composed of Platinum, Rhodium and Palladium supplied by W.C. Heraeus /22/.

The secondary catalyst has been installed into the support basket as precious metal coated mini raschig rings (HR-SC system of Heraeus). The supplier of the secondary catalyst is Heraeus, and the abatement efficiency for the secondary catalyst was estimated to be 90%. DNV was able to confirm that there have not been any changes in the abatement technology compared to previous project campaigns.

Several shutdowns of the plant were realized during this monitoring period as it is correctly reported in the monitoring report. These periods are reflected in the provided ER calculation spreadsheets /2/.

Further the NCSG analyser or its sampling system was faulty during the following periods (the values were significantly lower than the values measured when sampling system was operating normally), however the situation was solved by replacing the faulty hourly average NCSG values by the maximum hourly average value measured during the relevant campaign as per the methodology:

- From 7 August 2009 22:00 till 11 August 2009 11:00 (PC5)
- From 24 August 2009 12:00 till 27 August 2009 9:00 (PC5)
- From 13 May 2010 10:00 till 13 May 2010 14:00 (PC7)

The project team crosschecked this situation with downtime report /25/ and found the situation correctly reflected.

The plant shutdowns during the monitoring period are described in the MR and found consistent with the monitored data reported in the ER calculation spreadsheet /2/.

The verification team inspected the installation during the on-site visit and could confirm that all instrumentation necessary for the monitoring of the emission reductions were installed.

3.3 Information (data and variables) provided in the monitoring report that is different from that stated in the registered PDD

The total emissions reductions in this monitoring period are 57 345 tonnes of CO_2 equivalents in the period from 5 August 2009 to 1 July 2010 (i.e. 331 days). The yearly expected emissions reductions according to the registered PDD /3/ is 116 779 tonnes of CO_2 equivalents. This corresponds to emissions reductions of 105 901 tonnes of CO_2 equivalents in 331 days. The lower emission reduction corresponds with lower production NAP as it is

evaluated below and hence the reported emission reduction is acceptably lower than the expected.

The NAP production in this monitoring period is 48 838 $tHNO_3$. The maximum annual production capacity specified in the PDD is 106 621 $tHNO_3$, which correspond to 96 689 $tHNO_3$ in 331 days. Thus the total NAP value is below the design capacity and can be counted towards emission reduction. The low NAP values during the period is explained by the number of operating days (169) during the monitoring period, after deducting shut down periods.

The baseline emission factors applied in this monitoring period are as follows:

PC5: 0.00564 $tN_2O/tHNO_3$

PC6: 0.00561 $tN_2O/tHNO_3$

PC7: 0.00523 $tN_2O/tHNO_3$

Thus the baseline emission factors were slightly lower than the estimated value in the PDD (0.0061 $tN_2O/tHNO_3$), which also contribute to lower than estimated emission reductions.
The project emissions factors for individual campaigns covered in this monitoring period are as follows:

PC5: 0.00148 $tN_2O/tHNO_3$

PC6: 0.00147 $tN_2O/tHNO_3$

PC7: 0.00195 $tN_2O/tHNO_3$

The achieved abatement efficiency in this monitoring period is below 75%, which is lower that what was estimated in the PDD (90%), and also contribute to lower emission reductions.

3.4 Compliance of the monitoring plan with the monitoring methodology

As per para 203 of VVM version 01.2 /28/, the monitoring plan in the registered PDD version 2.0 of 5 April 2007 /3/ was confirmed to be in accordance with the approved monitoring methodology, AM 0034, version 02 "Catalytic reduction of N2O inside the ammonia burner of nitric acid plants" /27/, applied by the CDM project activity. Neither a revision nor a deviation to the monitoring plan has been requested to CDM Executive Board.

3.5 Compliance of monitoring with the monitoring plan

As per para 206 of VVM version 1.2 /28/, DNV confirms that the monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD of 5 April 2007 /3/. All parameters stated in the validated monitoring plan are monitored and reported appropriately.

3.6 Assessment of Monitoring Parameters

As per para 206 of VVM version 1.2 /28/, DNV verified the information flow for each parameter. Section 3.6.1 describes the data generation, aggregation and recording and how it has been verified by DNV. While sections 3.6.2 to 3.6.4 describe the verification of calculations and reporting by DNV for each of the parameters. Furthermore, as per para 209

(d) of VVM version 1.2, DNV confirms that the assumptions, emission factors, default values that are applied have been justified.

3.6.1 Information flow

The information and data flow is in compliance with the situation described in the monitoring plan presented in the PDD version 2.0 dated 5 April 2007 /3/. Simultaneously verification team confirms correct application relevant requirements of monitoring methodology AM0034, version 2 /27/.

The verification team confirms that the monitoring report includes all parameters and the monitored data at the interval required by the methodology and the PDD.

The common data flow systems have been used in the project activity for the following parameters:

- Stack gas flow rate and standardization calculation
- Stack gas N_2O concentration and calculation of amount of N_2O
- Operating parameters of the ammonia oxidation reactor (temperature, pressure, ammonia input)

The instrument transmitters continuously provide an analogue signal (4 to 20 mA) from the N_2O analyzer and the stack gas flow meter including the stack gas temperature and pressure. The signals are converted by the Programmable Logic Controller (PLC) into a digital signal which is then fed into SCADA data acquisition and database system. Thus collected and processed data, i.e. calculation, raw data, calculated values, are stored in the server continuously and available in the network system as digital values. The AEL two nitric acid plants has its own SCADA system on a dedicated PC, however the two SCADA PCs are directly connected to each other and each of the PCs receives all the measured data from the AMS and stores them. The instrumentation engineer in the plant transfers the data at least once a week into AEL's main IT system as well as making a complete copy of that week's data (2-second, hourly and daily averages) onto an external disc drive. That way there are already four copies of the original and unchanged data stored in four different locations. In addition, the hourly data are sent to N.serve on a regular basis (e. g. after each campaign) where they are also stored.

The SCADA system automatically produces comma separated files stored in Microsoft Excel of the 2-second values and it also automatically produces hourly and daily average values for each of the measured parameters. The hourly averages are the basis of the analysis of the data for the purpose of the calculation of the emissions factors for the baseline and for the project campaigns.

These are then extracted and converted into excel files /2/ which can then be imported into the N.serve Database Management System (N.DBMS).

The nitric acid production is measured by mass flow meter and the data are automatically transferred to the plant's control system. Daily cumulative data are stored and printed for archiving.

The verification team assessed the information flow and data collection system and confirms that it meets the requirements of the monitoring plan contained in the registered PDD /3/ as per the applied and approved methodology AM0034, version 02 /27/.

The verification team confirms that the monitoring report includes all parameters and the monitored data measured at the interval required by the methodology and PDD.

Each parameter and its corresponding values verified are listed in detail in Appendix B.

3.6.2 Historical data and permitted operating conditions

Historical data has been verified during the validation. However it was stated in the validation report that the verification of normal campaign length should be confirmed by the verifying DOE. The historic campaign length was determined in accordance with the methodology as 24 026.2 tonnes of 100% nitric acid during the 1st verification. The calculation of CL_{normal} is based on average of campaign length during the 5 historical campaigns /2/.

The parameters for determining the permitted operating condition include Oxidation Temperature (OT), Oxidation Pressure (OP), and Ammonia gas Flow Rate (AFR) as well as Ammonia to air ratio (AIFR). The permitted operating conditions were determined and verified by validating DOE /23/ as follows:

	OT_{normal}	OP_{normal}	$AIFR_{max}$	AFR_{max}
Data from 5 historical campaigns	810 – 915 ºC	860 – 910 kPa	11.5%	3.877 tNH_3/h

The ammonia oxidation catalyst for the historical campaign was supplied by W.C. Heraeus with composition of Platinum (Pt) 59%, Rhodium (Rh) 4% and Palladium (Pd) 37% and the same (without significant differences) was used in baseline campaign, and project campaigns of this verification period

3.6.3 Monitored data for baseline emissions

The baseline campaign emission factor was verified by DNV in the first verification /7/. It is confirmed that the calculation of the baseline emission factor is in accordance with the requirement of EB51 Annex 12. The detail assessment of baseline campaign data as performed during the first verification is presented below:

Data variable	**Tag. No.**	**Reported value for the baseline campaign period**	**Assessment / Observation**
VSG_{BC} Normal gas volume flow rate of the stack gas during baseline	**FT-200**	42 983 Nm^3/h	VSG_{BC} was verified by DNV to be correctly reported /2/ The measurement range of the flow meter is appropriate and the measured average flow rate is within the range expected for a nitric acid plant with a capacity of 292.112 metric tonnes per day. The calibration is performed as per the monitoring plan in the registered PDD and documented /26/.

			Further DNV can confirm the correction factor determined in QAL 2 for VSG was retroactively and correctly applied to the data for VSG monitored during the baseline campaign /4/.
$NCSG_{BC}$ N_2O concentration in the stack gas (mgN_2O/Nm^3, converted from ppm)	**AT-110**	1 764.44 mg/Nm^3	$NCSG_{BC}$ was verified by DNV to be correctly reported /2/ The zero and span gas calibration (QAL3) were performed twice a week as per the monitoring plan in the registered PDD and documented /12/. QAL1 was performed in June 2006 /14/ and QAL2 tests were conducted in February 2008 /4/. DNV can confirm the correction factor determined in QAL2 for NCSG was retroactively and correctly applied to the data for NCSG monitored during the baseline campaign /4/.
OH_{BC} Operating hours of the plant	N/A	1 474 h	OH_{BC} was verified by DNV to be correctly reported /2/
NAP_{BC} t HNO3 Nitric acid 100% concentrated produced over a project campaign	**FT-111**	17 718 $tHNO_3$	NAP_{BC} was verified by DNV to be correctly reported /2/
EF_{BL} Emission factor for baseline period $tN_2O/t\ HNO_3$	N/A	0.00564 $t\ N_2O/\ t\ HNO_3$	EF_{BL} was verified by DNV to be correctly calculated and reported according to EB 51 Annex 12 /2/.
AFR Ammonia gas flow rate to the AOR	FT101	Available in excel sheets /4/	AFR is continuously monitored. $NCSG_{BC}$ and VSG_{BC} values monitored when AFR is exceeding AFRmax are excluded prior to the calculation of the average values for NCSGBC and VSGBC /2/.

			Calibration is performed in accordance to the procedure "C9NA 002 Nitrates calibration procedure". Calibration certificates were checked and DNV is able to confirm the calibration result is OK. The calibration is valid for the entire period for the baseline campaign./26/
AIFR Ammonia to Air Ratio	FT-100 (air flow)	Available in excel sheets /4/	AIFR is calculated from results of AFR (Tag No.: FT101) and Primary Air flow rate (Tag No.: FT100). $NCSG_{BC}$ and VSG_{BC} values monitored when AIFR is exceeding $AIFR_{max}$ are excluded prior to the calculation of the average values for $NCSG_{BC}$ and VSG_{BC}. /2/ Calibration is performed in accordance to the procedure "C9NA 002 Nitrates calibration procedure". Calibration certificates were checked and DNV is able to confirm the calibration result is OK. The calibration is valid for the entire period for the baseline campaign./26/
OT_h Oxidation temperature for each hour	TC102-A TC102-B TC102-C TC102-D	Available in excel sheets /4/	OT_h is monitored hourly. $NCSG_{BC}$ and VSG_{BC} values monitored when OT_h is outside the permitted operating range are excluded prior to the calculation of the average values for $NCSG_{BC}$ and VSG_{BC}. /2/ Calibration is performed in accordance to the procedure "C9NA 002 Nitrates calibration procedure". Calibration certificates were checked and DNV is able to confirm the calibration result is OK. The calibration is valid the entire period for the baseline campaign./26/
OP_h Oxidation Pressure for each hour	PT-100	Available in excel sheets /4/	OP_h is monitored hourly. $NCSG_{BC}$ and VSG_{BC} values monitored when OP_h is outside the permitted operating range are excluded prior to the calculation of the average values for $NCSG_{BC}$ and VSG_{BC} /4/. Calibration is performed in accordance to the procedure "C9NA 002 Nitrates calibration procedure". Calibration certificates were checked and DNV is able to confirm the calibration result is OK. The calibration is valid the entire period for the baseline campaign/26/.

GS_{BL} Gauze supplier for baseline campaign	N/A	W.C. Heraues	Verified by validating DOE/23/
GC_{BL} Gauze composition for baseline campaign	N/A	59% Pt 4% Rh 37% Pd	Verified by validating DOE /23/ This parameter was also verified at the site visit during the first verification period.

The baseline emission factor should be recalculated, when the project campaign is shorter than CL_{normal} (24 026.2 $tHNO_3$). The baseline campaign length, CL_{BL} is 17 718 $tHNO_3$. As the first campaign covered in this verification period is shorter than $CL_{normal,}$ but at the same time longer than the CL_{BL} (22 642.29 $tHNO_3$ for PC5) the baseline emission factors can be applied without recalculation for this campaign. The next two campaigns were shorter than both CL_{normal} and CL_{BL}(16 293.7 $tHNO_3$ for PC6 and 9 901.8 $tHNO_3$ for PC7), thus the value of the baseline emission factors were recalculated for these campaigns (0.00561 $tN_2O/tHNO_3$ for PC6 and 0.00523 $tN_2O/tHNO_3$ for PC7). Detail assessment is included in section 3.7.1 below.

3.6.4 Monitored data for project emissions

The only emission source from the project is the remaining quantity of N_2O in the stack gas. The N_2O concentration (NCSG) in the gas stack is measured by N_2O gas analyzer, type of sensor NDIR (ABB AO2040 Uras 14) with continuously measurement, recording frequency 2 s and calculated as hourly average. Due to delays in realization of the annual AST (10-11 June 2009 /5/ and 06 July 2010 /6/), the maximum permissible error of the measurement device was conservatively applied to the N_2O concentration values in the period from 10 June 2010 till the end of last campaign PC7 (1 July 2010) in provided raw data excel file in accordance with EB52 Annex 60.
The normal gas volume flow (VSG) rate of the stack gas is measured by flow meter Emmerson Rosemount Annubar, Model 485 on differential pressure principle. The measurement frequency is continuous, recording frequency is 2 second and the data are used for calculation of hourly average. Due to delays in realization of annual AST (10-11 June 2009 /5/ and 06 July 2010 /6/), the maximum permissible error of the measurement device was conservatively applied to the VSG value in the periods from 10 June 2010 till the end of last campaign PC7 in provided raw data excel file in accordance with EB51 Annex 60.

The corrected set of data (also including replacement of faulty values) is fed into the database N.DBMS /2/ and statistical analysis is realized according to the methodology AM0034. As a result new sample means are calculated for the NCSG and VSG values, which are used in emission reduction calculation spreadsheet /2/.
According to AM0034 the emissions reductions can only be requested for the nitric acid production equal to the design capacity. The maximum annual production is given in the PDD as 106 621 $tHNO_3$. The NAP production and comparison with design capacity for the project campaigns included in this monitoring period is as follow:

Campaign No	NAP ($tHNO_3$)	Campaign duration (days)	Production capacity* ($tHNO_3$)
5.	22 642.29	89	25 998
6.	16 293.70	98	28 627
7.	9 901.80	85	24 829

Therefore the NAP production was below the design capacity in each campaign.

The NAP production is measured by Coriolis mass flow meter Emerson CMF 300, which measured continuously density and temperature and these measurements is used for calculation of the produced nitric acid. The resulted value is used for conversion to 100% nitric acid produced.

DNV can confirm that the gauze supplier for this monitoring period was the same as for the baseline, i.e. W.C Heraeus /22/, and the composition of the catalyst is without significant difference from baseline campaign.

The details about individual monitored parameters are included in Appendix B of this report.

3.6.5 Emissions outside the project boundary and leakages

There are no additional emissions to be recorded outside the project boundary. As per the requirement of the methodology leakage does not need to be taken into consideration.

3.7 Assessment of data and calculation of emission reductions

DNV checked the updated version of the Monitoring report /1/ and the relevant updated spreadsheets /2/ and found them correct. The updated versions of documents correctly addressed the inconsistencies identified during review of the documents and the site visit (refer to CAR1 to CAR 3).

The calculations of emission reduction are further assessed below:

1. The N_2O concentration and normal gas volume flow rate in the stack gas were corrected due to delay in AST /5//6/ (ref. section 3.6.4): the maximum permissible error of the measurement devices was conservatively applied for periods from 10 June 2010 till the end of last campaign PC7.
2. In the period of faulty N_2O concentration measurements (ref. section 3.2), the NCSG data (hourly average) were correctly replaced by the maximum hourly average NCSG data determined during the relevant project campaign.
3. The project campaign's hourly averages of N_2O and gas flow in the gas stack were calculated correctly with application of 95% confidence interval. Total N_2O emissions are calculated correctly for each project campaign. The latest AST reports provided by Müller BBM dated 6 July 2010 /6/ (previous 10 – 11 June 2009 /5/) confirmed the correction factors determined in QAL2

conducted on 7 February 2008 to 13 February 2008 by TÜV SÜD /4/ as follow: 0.97 for N_2O concentration and 0.962 for normal gas volume flow rate DNV can confirm that these correction factors were correctly applied to the campaign mean NCSG and VSG value in the emission reduction calculations /2/.

4. The nitric acid production calculated as 100% HNO_3 were calculated correctly for the project campaigns. The calculation is provided based on continuous measurement of the mass flow and recalculation to 100% concentration of nitric acid.
5. The baseline emission factor was correctly determined by comparing a project campaign length with the average historical campaign length, and subsequently re-calculating the corresponding baseline emission factor as necessary (PC6 and PC7) (see chapter 3.7.1 below).
6. The project emission factor was correctly calculated by correct calculations and comparison of a campaign specific emission factor and the corresponding moving average emission factor (refer to section 3.7.2 below).
7. The emission reductions were then correctly calculated and it was confirmed that the nitric acid production did not exceed the design capacity of the plant in this monitoring period (refer to section 3.3).

According to the AM0034 version 2 /27/, the emission reductions for the project activity over a specific campaign are 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 N_2O.

As per VVM 1.2 para 209 (c) /28/, DNV confirms that appropriate methods and formulae for calculating baseline emissions and project emissions have been applied.

3.7.1 Baseline emission factor

The historic campaign length is 24 026.2 tonnes of 100% nitric acid, and the baseline campaign length is 17 718 tonnes of 100% nitric acid. Since the project campaign PC 5 verified in this period (22 642.29 t 100% HNO_3) is longer than baseline campaign length, the baseline factor applied was without recalculation (0.00564 $tN_2O/tHNO_3$) as verified during the first verification by DNV /7/ and confirmed in section 3.6.3 of this report.

The baseline emission factors for project campaigns (PC6 of 0.00561 $tN_2O/tHNO_3$ and PC7 of 0.00523 $tN_2O/tHNO_3$) have been recalculated as per Annex 12 of EB51 report since the campaign lengths (16 293.70 t 100% HNO_3 for PC6 and 9 901.80 t 100% HNO_3 for PC7) were shorter than both the historic campaign length (24 026.2 $tHNO_3$) and the baseline campaign length (17 718 t 100% HNO_3). Thus, the values of N_2O concentration of stack gas ($NCSG_{BC}$) that were measured during the baseline campaign beyond the project campaign length were eliminated from the calculation of EF_{BL} as per the requirements of methodology AM0034 (version 02) following Annex 12 of EB51 report /34/.

It was confirmed during site visit that no N_2O regulation has been issued by the government. Thus no N_2O emission cap was applied in the calculation.

3.7.2 Project emission factor

The calculation of campaign specific emission factor for each of the project campaigns /2/ was confirmed to be in line with the requirements in AM0034 version 02 /27/; the resulting campaign specific emission factors, moving average emissions factors and emissions factors applied for each project campaign are presented in table below:

No. campaign	EF_n [$tN_2O/tHNO_3$]	$EF_{ma,n}$ [$tN_2O/tHNO_3$]	EF_p [$tN_2O/tHNO_3$]
PC5	0.00148	0.00173	0.00173
PC6	0.00147	0.00169	0.00169
PC7	0.00195	0.00172	0.00195

The moving average emission factors were calculated correctly as average of all project campaigns emission factors verified during previous verifications /7//8/, including the emission factor of the campaign itself.The values of all emission factors for previous campaigns are listed below:

No. campaign	EF_n [$tN_2O/tHNO_3$]	$EF_{ma,n}$ [$tN_2O/tHNO_3$]
PC1	0.00195	0.00195
PC2	0.00253	0.00224
PC3	0.00090	0.00179
PC4	0.00181	0.00179
PC5	0.00148	0.00173
PC6	0.00147	0.00169
PC7	0.00195	0.00172

The minimum project emission factor (EF_{min}) will be determined and applicable only after the 10^{th} project campaign is completed.

3.7.3 Emission reduction

The calculation of emission reductions for each project campaign was conducted as described in the section 1.4 of this report; and was in line with the requirements in AM0034 /27/. Nitric acid production for each project campaign covered in this verification period is below the design capacity (ref. section 3.6.4). The total emission reductions for this verification period were correctly calculated as the sum of the emission reductions for the three project campaigns.

There is no uncertainty related to reporting of raw data used in the calculation of emission reduction as all monitored parameters are collected by the automated measurement system and converted automatically to the excel files. Further data processing is realized by N.DBMS

database. This database realized automatic excluding of data due to all conditions required by the methodology AM0034, version 2 /27/. Spot checks of raw data transferred to the excel sheet were performed during the site visit. No mistake of data transfer was identified.

The emissions reductions in this monitoring period are 57 345 tonnes of CO_2 equivalents in the period from 5 August 2009 to 1 July 2010 (i.e. 331 days) equals to 173.3 tCO_2e/day average. The yearly (considering 365 operational days) expected emissions reductions according to the registered PDD are 116 779 tonnes of CO_2 equivalents, which corresponds to emissions reductions of 319.9 tCO_2e/day average. And hence the reported emission reduction in the monitoring period is lower than the expected in the registered PDD (ref .section 3.3 for details).

3.8 Quality of Evidence to Determine Emission Reductions

The emission reduction calculation are done in two excel sheets /2/. The database N.DBMS is used to determine the maximum, minimum and average from the raw data set and apply statistical analysis as per the methodology AM0034 /27/ and the PDD /3/. The results of the database are transferred to the excel sheet for emission reduction calculations, and this was further cross checked by DNV. In order to cross check the results of the database, a third excel spreadsheet is provided (Project 1171 Monitoring period 03_03_08_2009-01_07_2010 Emission reduction calculation_V3.xlsx) /2/ , which includes the determination of the mean value from the raw data as well as emission reduction calculations. DNV verified the calculations and no deviation was found with the results of the database.

The raw data are stored by SCADA system and simultaneously these data are transferred into main AEL's IT system by instrumentation engineer at least once a week. This backup covers 2-second, hourly and daily averages.

All provided data was crosschecked during the site visit and except minor inconsistencies in the table of plant's events, which were corrected in third version of the monitoring report, they are found as correct. I.e. the raw data presented in excel sheets ensures possibility to clearly review the calculations by DNV.

All measurement devices are regularly calibrated and eventual delay in calibration is correctly reflected in the raw data file and verified by DNV. DNV also confirms as correct every application of correction factors from relevant QAL2 report /4/. No assumptions are used, that have any material influence on reported emission reductions.

As per VVM 01.2 para 208 (a) /28/, complete set of data for the monitoring period was made available to DNV.

As per para 208 (c) of VVM version 01.2 /28/, DNV confirms that the calculations of baseline and project emission factors have been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology document

3.9 Management System and Quality Assurance

The plan has implemented management system according to ISO 9001 /20/ and ISO 14001 /21/, which covers also instructions relevant for CDM project. These instructions described in detail authority and responsibility established in the monitoring plan included in the PDD /3/.

The monitoring system has quality assurance and quality control ensured by following steps:

- QAL1 /14/: According to CDM-EB48 report, para 77, "for project activities where the automated monitoring system (AMS) for the measurement of N_2O is subject to compliance with EN14181 as stipulated in the applied methodologies, the Board further clarified that the suitability test QAL1 for the AMS by any entity is acceptable provided that a documentary evidence is submitted which confirms the measures and method conducted are in accordance with the provisions specified in EN ISO14956". DNV was able to verify that the evaluation has been carried out by a third party laboratory/testing institute with 17025 accreditation before installation of the AMS and the evaluation is deemed to be acceptable.
- QAL2: The monitoring system is regularly tested under QAL2 tests (every 5 years) according to EN 14181. The relevant QAL2 tests were carried out by TÜV SUD Industrie Services in 7 till 13 February 2008 /4/.
- QAL3: Span and zero checks are carried out twice a week /24/.
- AST: AST test is carried out annually between QAL2 test by accredited company. The relevant AST for this period has been realized by Müller BBM in 10-11 June 2009 and 6 July 2010. Both of the tests confirmed validity of correction factors from QAL2 tests. The delay from annual calibration period second AST test were reflected by application of maximum permissible error of the instruments for NCSG (2.69% /4/) and VSG (3.22% combined uncertainty for normalized stack flow /4/) as it is required by EB 52 annex 60 /32/ for the period from 10 June 2010 till 1 July 2010 (end of this monitoring period)

4 CERTIFICATION STATEMENT

DNV Climate Change Services AS (DNV) has performed the verification of the emission reductions that have been reported for the "Project for the catalytic reduction of N2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa" (UNFCCC Registration Reference No. 1171) for the period 5 August 2009 to 1 July 2010. The project was registered on 5 November 2007 and the crediting period is 5 November 2007 to 4 November 2017 (fixed).

The project participants are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project.

It is DNV's responsibility to express an independent verification statement on the reported GHG emission reductions from the project. DNV does not express any opinion on the selected baseline scenario or on the validated and registered PDD.

DNV conducted the verification on the basis of the monitoring methodology AM0034 (version 02), the monitoring plan contained in the registered Project Design Document of 5 April 2007 and the monitoring report (Version 05) dated 28 August 2012. The verification included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied and ii) the collection of evidence supporting the reported data.

DNV's verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. DNV planned and performed the verification by obtaining evidence and other information and explanations that DNV considers necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

DNV is able to confirm that project is implemented in accordance with the registered project design document version 4 of 5 April 2007, and that the monitoring plan is in accordance with the approved methodology AM0034, version 02 "Catalytic reduction of N_2O inside the ammonia burner of nitric acid plants" applied by the project. Furthermore, DNV confirms the monitoring is in accordance to the monitoring plan.

In our opinion the GHG emissions reductions of the "Project for the catalytic reduction of N2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa" (UNFCCC Registration Ref. No. 1171) for the period 5 August 2009 to 1 July 2010 are fairly stated in the monitoring report (Version 05) dated 28 August 2012.

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AM0034 (version 02) and the monitoring plan contained in the registered PDD of 5 April 2007. DNV confirms that the calculations of baseline emissions, project emissions and leakage as appropriate have been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology.

DNV Climate Change Services AS is able to certify that the emission reductions from the "Project for the catalytic reduction of N2O emissions with secondary catalyst inside the

ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa" during the period 5 August 2009 to 1 July 2010 amount to 57 345 tonnes of CO_2 equivalent.

Prague and Oslo, 30 August 2012

Zuzana Andrtová

CDM Verifier
DNV Prague, Czech Republic

Head of Approval Centre & Nordic
DNV Climate Change Services AS

5 REFERENCES

Documents provided by the Project Participants that relate directly to the GHG components of the project. These have been used as direct sources of evidence for the periodic verification conclusions, and are usually further checked through interviews with key personnel.

/1/ N.Serve: Monitoring report "Project for the catalytic reduction of N_2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa", Version 05 dated 28 August 2012 (previous version: version 01 dated 25 November 2010 and version 2 dated 25 November 2011)

/2/ N.Serve: Spreadsheets:

- CDM Data No.9 3rd MP_update.xlsx – raw data for calculation
- AEL_No9_PC_Calc_V11b_MS_120828.xlsx – database calculation of emission reduction
- Project 1171 Monitoring period 03_03_08_2009-01_07_2010 Emission reduction calculation_V3.xlsx – Excel calculation of emission reductions from raw data

/3/ N.serve Environmental services: PDD of Project for the catalytic reduction of N2O emissions with secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa, version 2.0, dated 5 April 2007

/4/ TÜV SÜD: QAL2 report, 7 – 13 February 2008

/5/ Müller-BBM: AST Report, dated 27 July 2009 (testing period 10 to 11 June 2009)

/6/ Müller BBM: AST report dated 26 October 2010 (tests on 6 July 2010), valid until 05 July 2011.

/7/ DNV: Verification report No. 2010-0900, revise 02, 22 May 2012 (1st verification)

/8/ DNV: Verification report No. 2010-9065, revise 01, 1 September 2010 (2nd verification)

/9/ African Explosives Ltd.: Calibration procedures:
N_2O gas from analyser No. 11NA AT-76020/2, dated 22 June 2009
N_2O gas from analyser No. NO. 09NA AT-110/2, dated 22 June 2009

/10/ Modderfontein Laboratory Services (Pty) Ltd.: Analytical report, Certification of the N_2O calibration gas, 28 November 2008

/11/ Intergas: Certificate of composition N_2O, 13 November 2006 valid till 12 November 2011

/12/ African Explosives Ltd.: Span gas tracking (period Sept 2007 till March 2011)

/13/ African Explosives Ltd.: Spare parts for AMS

/14/ TÜV SUD, EN 14956 QAL 1 report (No 921029) for Uras 26 (follow-up version of Uras 14) , June 2006

/15/ Afrox Ltd.: Certificates of analysis of calibration test gases (995, 1011 and 1012 ppm) during the monitoring period. Certification dates: 19 March 2008, 2 September 2009 and 17 March 2010 (filled 19 February 2008, 26 August 2009 and 15 March 2010). All bottles were consumed prior expiration date.

/16/ African Explosives Ltd.: Procedure for CDM data preparation, revision 00, dated 13 February 2008.

/17/ ALPRET Controls Specialists: Nitric acid flow meter Tag. No. FT-111 calibration,

dated 04 January 2007, dated 11 April 2008, dated 25 November 2008 and 24 February 2009 (validity of each calibration 2 years)

/18/ African Explosives Ltd.: Internal calibration of individual instruments for the 3rd verification period:

- Oxidation temperature (OTh) Tag. No. TC102-A, TC102-B, TC102-C, TC102- Dates of calibration during project campaigns: 9 March 2009, 4 November 2009, 4 May 2010, 28 August 2010
- Oxidation pressure (OPh) Tag.no. PT-100 - Dates of calibration during project campaign: 6 March 2009, 5 November 2009, 4 May 2010, 28 August 2010
- Ammonia flow rate (AFR) Tag.no. FT-101- Dates of calibration during project campaigns: 6 March 2009, 5 November 2009, 4 May 2010, 28 August 2010
- Ammonia to Air (calculated from ammonia gas flow rate and air flow to AOR), FT-100 (air flow): 6 March 2009, 5 November 2009, 4 May 2010, 28 August 2010
-

/19/ SABS: ISO 9001 certificate of Modderfontein Laboratory Services (Pty) Ltd., valid until 24 November 2012

/20/ SABS Commercial Ltd.: ISO 9001:2008 Certificate number LS 0243 valid until 8 September 2012

/21/ SABS Commercial Ltd.: ISO 14001:2004 Certificate number EM 140394 valid until 3 February 2012

/22/ Heraeus: AEL No. 9 Campaign confirmation

/23/ TÜV SUD: Validation report for the catalytic reduction of N2O emissions with a secondary catalyst inside the ammonia reactor of the No. 9 nitric acid plant at African Explosives Ltd ("AEL"), South Africa, report no. 912444, 10 May 2007..

/24/ African Explosives Ltd.: QAL 3 records (realized twice in week, reviewed period 6 December 2007 till 29 November 2010

/25/ African Explosives Ltd.: Downtime report no.9 3rd MP.xlsx

/26/ African Explosives Ltd.: Calibration certificates for the baseline campaign

Calibration certificates for stack gas parameters by AEL Ltd:

VSG - tail gas flow (FT-200):

Calibration dates: August 2007, November 2007, February 2008 (exact dates not available). Validity of calibration: 4 months

NCSG - N_2O concentration in the stack gas (AT-110): see reference /14/, /4/

TSG – Tail gas temperature (TE-120):

Calibration dates: August 2007, November 2007, February 2008 (exact dates not available). Validity of calibration: 1 year

PSG- Tail gas pressure (PT-200):

Calibration dates: August 2007, November 2007, February 2008 (exact dates not available). Validity of calibration: 1 year

Nitric acid flow meter (FT-111):

- ALPRET Controls Specialists: Nitric acid flow meter Tag. No. FT-111. Date 04.01.2007. Valid until 03.01.2010

- ALPRET Controls Specialists: Nitric acid flow meter Tag. No. FT-111. Date 11.04.2008. Valid until 10.04.2011

- ALPRET Controls Specialists: Nitric acid flow meter Tag. No. FT-111. 25.11.2008. Validity: 24.11.2011

Calibration certificates for AOR parameters equipment by AEL Ltd:

AFR - Ammonia gas flow rate (FT-101):

Calibration dates: 04 Sept.2007 and 10 Feb. 2008. Valid until 9 Sept. 2008.

AIFR - Ammonia to Air (calculated from ammonia gas flow rate and air flow to AOR), FT-100 (air flow):

Calibration dates: 04 Sept.2007 and 10 Feb. 2008. Valid until 9 Sept. 2008.

OTh – Oxidation temperature (TC102-A, TC102-B, TC102-C, TC102):
Calibration dates: 04 Sept.2007 and 10 Feb. 2008. Valid until 9 June 2008.
OPh – Oxidation pressure (PT-100):
Calibration dates: 04 Sept.2007 and 10 Feb. 2008. Valid until 9 Sept. 2008.

Background documents related to the design and/or methodologies employed in the design or other reference documents.

/27/ CDM Executive Board, Approved Monitoring methodology AM0034, version 02
/28/ CDM Executive Board: Validation and Verification Manual. Version 01.2
/29/ CDM Executive Board, Guidelines on completeness check of requests for issuance, CDM EB in its 48th meeting on 14 – 17 July 2009
/30/ CDM Executive Board, Issuance completeness checklist, version 02.0 of 1 July 2011
/31/ CDM Executive Board, Issuance information and reporting checklist, version 02.0 of 1 July 2011
/32/ CDM Executive Board: EB meeting 52, annex 60
/33/ DNV: CDMJI – ICP-5-8-CDMJI-g13
/34/ CDM Executive Board: EB meeting 51, annex 12

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

/35/ Martin Stilkenbäumer, Project Manager and Monitoring Expert, N.serve
/36/ Hendrik Burger, Production Manager, Nitrates, AEL
/37/ Thembeka Lucy Dhlodhlo, Production Technical Services, Nitrates, AEL
/38/ Piet de Villiers, AMS calibration, AEL
/39/ Chris Tilley, Modderfontein Laboratory Services (Pty) Ltd.

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APPENDIX A

CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS

Corrective action requests

CAR ID	Corrective action request	Response by Project Participants	DNV's assessment of response by Project Participants
CAR 1	The table of parameters VGS, TSG and PSG in the monitoring report should be updated to include the correct description of calibration and QA/QC routines. DNV was able to confirm during the site visit that the QA/QC is in accordance with the Monitoring plan in the PDD, however; the description in the MR was not correct and needs to be updated.	The description of calibration routines in the Monitoring report was updated in the tables for VSG, TSG and PSG.	The monitoring routines and calibrations are correctly described in the revised Monitoring report, version 3 /1/ and the description of the processes correspond with the PDD as well as with the actual routine observed during the site visit. The CAR is closed.
CAR 2	The nitric acid production values of the 7th campaign should be corrected in the monitoring report to be in accordance with the excel calculations.	The results for nitric acid production were corrected in the MR	The value in the revised Monitoring report, version 3 /1/ is correct and correspond with provided excel data /2/. The CAR is closed
CAR 3	The reporting of the events should be improved and corrected in accordance with Downtime report file. All information, which influences the CER calculations, should be included.	The reporting of events was updated in the MR. Three periods were identified when the NCSG analyser pump or sampling system. The NCSG results for these periods were replaced by the maximum NCSG reading for the specific campaign (07/08/2009 22:00 – 11/08/2009 10:00, 24.08.2009 12:00 - 27.08.2009 09:00 and 13.05.2010 10:00 - 13.05.2010 14:00).	The information in the revised Monitoring report, version 3 /1/ corresponds with Downtime report /25/. The CAR is closed.

CAR 4	The corrected file for zero/span gas calibration is requested. Further the zero/span gas calibration procedure should be updated to describe actions to be taken when the allowable limit is exceeded.	The updated file for NCSG calibration documentation (zero/span – evaluation) was provided. The procedure was updated and provided as well.	The provided evidences – zero/span evaluation /12//24/ as well as updated calibration procedures /9/ were found correct by DNV. The CAR is closed

Clarification requests

CAR ID	Clarification request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 1	Information about spare parts (what is on store for monitoring equipment) or a procedure for maintenance should be provided.	An updated spare parts list was provided	The spare parts list /13/ was provided and DNV considers it reflects good maintenance practice. The CL is closed

CAR ID	Clarification request	Response by Project Participants	DNV's assessment of response by Project Participants
CL 2	The analysis routine for QAL3 is not fully consistent with good practices. The gas used is supplied with a certificate of analysis from AFROX. However the certificate is not stating the concentration of N_2O at the sufficient level of accuracy, hence this is provided by the local laboratory. The PP is requested to clarify that the gas used for QAL 3 is at a sufficient level of accuracy.	The concentration of the calibration gas provided by AFROX is analysed by an external laboratory (Modderfontain Laboratory services (Pvt) Ltd.) by gas chromatography. The exact concentration of the calibration gas is certified by the laboratory and a respective certificate is issued. For calibration of the gas chromatography a Standard gas provided by "Intergas International Gases and Chemicals Limited – Newcastle-under-Lyme, UK" was used. The accuracy of the certified concentration was recertified. The validity of the new certificate is until 12/11/2011. For the future AEL will procure span gas with sufficient certification from a different supplier. Once this is the case the extra analyses by the laboratory will not be needed any more.	The accuracy of the gas for QAL3 test was properly demonstrated by analysis from Modderfontain Laboratory services (Pvt) Ltd. /16/ and description of calibration procedures for the analytical methodology, which is used for concentration setting /10/. The traceability was improved by span gas tracking /12/. The CL is closed.

Forward action requests from previous verification

FAR ID	Forward action request	Summary of how FAR has been addressed in this reporting period	Assessment of how FAR has been addressed
FAR 1	It is found that incorrect transfer or missing values from production logs to excel sheet of operation data and stack monitoring data. The error is minor and does not have any effect on the emission reduction calculations, however procedure for data transfer should be improved.	AEL updated the respective procedure in order to avoid such mistakes in the future..	The updated procedure for data handling /16/ was provided to DNV. The routine was also observed during the site visit. The FAR is closed.

Forward action requests from this verification

FAR ID	Forward action request	Response by Project Participants	DNV's assessment of response by Project Participants
FAR 1	The calibration gases information is included as history in table but without clean traceability of the bottle using. The original certificates from AFROX are not stored currently. The information about traceability should be clear.	A span gas list with first and last day of use was provided.	The span gas list/12/ as well as gas certificates /15/ were provided to DNV. The FAR is closed.

FAR ID	Forward action request	Response by Project Participants	DNV's assessment of response by Project Participants
FAR 2	The steps related to hand-transferring of data in the QA/QC procedures should be improved (for example typing of QAL 3 results to table for Shewart chart).	The transfer of data is improved by instituting files that are kept at the analysers. The calibration reports will be included in the files and a member of the project team will once a week then transfer the data to the Excel file. This would prevent the instrumentation technician from having to use a book to first write down the results before transferring it to the calibration report.	The procedure has been demonstrated by improving QAL3 report /24/ including also graphical presentation of results (Shewart chart) and found sufficient by DNV. The FAR is closed.
FAR 3	The QA/QC procedures for analysis of "standard" N_2O gas should be improved.	AEL ISO 9001 certificate for the lab provided	The lab provided mentioned certificate /19/ as well as Analytical report, Certification of the N2O calibration gas /10/. The reals situation should be observed during next verification. The FAR is still open.

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APPENDIX B

ASSESSMENT OF MONITORING DATA FOR PROJECT EMISSIONS

Data variable	**NCSG** N_2O concentration in the stack gas at normal conditions (101.325 kPa, 0 °C).	**Reported value for the project period (before application of QAL2 correction factor)** PC5: 416.18 mgN_2O/Nm^3 PC6: 471.48 mgN_2O/Nm^3 PC7: 609.86 mgN_2O/Nm^3
Assessment/Observation		
Instruments and locations:	***Serial no. AT-110*** ABB AO2040 Uras 14 N_2O gas analyser with NDIR spectrometry *Accuracy: 2.69%* *Instrument number: 3.346854.7*	
Accuracy:	The accuracy represents good monitoring practice, however it is not directly set in the PDD	
Measuring and recording frequency:	**Measuring frequency:** Continuously **Recording frequency:** every 2 second	
Calibration information	**Calibration frequency:** Internal calibration by AEL Ltd.: Zero and span check and calibration in case of deviation > 1% of range of analyzer (QAL3), realized twice in week External calibration: QAL2 by an authorized ISO 17025 institute every 5 year and AST by an authorized ISO 17025 institute annually **Latest date of calibration:** QAL2: 7 – 13 February 2008 (valid till 6 February 2013) /4/ AST: 10 – 11 June 2009 (valid until 9 June 2010) /5/ and 6 July 2010 (valid until 5 July 2011) /6/ QAL3: twice in week /11//12//15//24/ **Validity of calibration:** the validity is 5 year for QAL2 and 1 year for AST **Company performing the calibration:** TÜV SÜD (QAL2) and Müller BBM (AST tests) **Did the calibration confirm proper functioning of monitoring equipment:** Yes	

	The selected periods for individual tests represents good practice. The delays between individual AST tests were reflected by application of maximum permissible error (2.69%) of the instrument to NCSG raw data /2/ in accordance with EB 52 annex 60 /32/. The periods are between scheduled and realized date of the AST: - From 10 June 2010 to 1 July 2010 DNV confirms that the calibrations are valid throughout the monitoring period and the delays in calibration were correctly addressed.
Information Flow:	The data are automatically stored in the SCADA Data Acquisition System. Once a month the results will be downloaded from SCADA to an excel file for analysis and calculation. The raw data will be saved on a DAT device and will be stored in a strongbox in the IT office. All data necessary for the emission reduction calculation are digitally transferred from the Plant data system (SCADA) to the dedicated relational database management system (N.DBMS). DNV confirms the successful verification of information flow of this parameter. (see also chapter 3.6.1).
Verification method:	Raw data of the Excel sheet /2/ from the monitoring period were provided and checked by DNV. Random picked data points were checked against data stored on the monitoring PC.
Cross-check (if applicable)	The data are cross-checked with the concentration measurement by a SRM during the QAL 2 test. Further the raw data were random check as mentioned above following the DNV internal. procedure CDMJI – ICP-5-8-CDMJI-g13
QA/QC:	QAL2: 7 – 13 February 2008 (valid till 6 February 2013) /4/ AST: 10 – 11 June 2009 /5/ and 6 July 2010 (valid until 5 July 2011) /6/ QAL3: twice in week /11//12//15//24/ The accuracy and the calibration interval of the monitoring equipment is in accordance with the relevant guidance of EB /32/ and is controlled and calibrated in accordance with the monitoring plan /3/.

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Partial data (if applicable)	NA

Data variable	**VSG** Normal gas volume flow rate of the stack gas	**Reported value for the project period (before application of QAL2 correction factor)** PC5: 41 138 Nm^3/h PC6: 40 976 Nm^3/h PC7: 40 196 Nm^3/h
Assessment/Observation		
Instruments and locations:	***Tag no. FT-200*** Emerson Rosemount Annubar Model 485 with 3051 DP transmitter *Accuracy: 2.65% per QAL2 (combined uncertainty incl. TSG and PSG: 3.22%)* *Instrument number: 0305RT32A11B3*	
Accuracy:	The accuracy represents good monitoring practice, however it is not directly set in the PDD	
Measuring and recording frequency:	**Measuring frequency:** Continuously **Recording frequency:** every 2 second	

Calibration information	**Calibration frequency:** Internal calibration by AEL Ltd after each campaign, usually every 4 month /18/. External calibration: QAL2 by an authorized ISO 17025 institute every 5 year and AST by an authorized ISO 17025 institute annually **Latest date of calibration:** QAL2: 7 – 13 February 2008 (valid till 6 February 2013) /4/ AST: 10 – 11 June 2009 /5/ and 6 July 2010 (valid until 5 July 2011) /6/ **Validity of calibration:** the validity is 5 year for QAL2 and 1 year for AST **Company performing the calibration:** TÜV SÜD (QAL2) and Müller BBM (AST tests) **Did the calibration confirm proper functioning of monitoring equipment:** Yes The selected periods for individual tests represents good practice. The delays between individual AST tests were reflected by application of maximum permissible error (3.22%) of the instrument to normalised VSG raw data (combined error for VSG, TSG and PSG) /2/ in accordance with EB 52 annex 60 /32/. The periods are between scheduled and realized date of the AST: - From 10 June 2010 to 1 July 2010 DNV confirms that the calibrations are valid throughout the monitoring period and the delays in calibration were correctly addressed.
Information Flow:	The data are automatically stored in the SCADA Data Acquisition System. Once a month the results will be downloaded from SCADA to an excel file for analysis and calculation. The raw data will be saved on a DAT device and will be stored in a strongbox in the IT office. All data necessary for the emission reduction calculation are digitally transferred from the Plant data system (SCADA) to the dedicated relational database management system (N.DBMS). DNV confirms the successful verification of information flow of this parameter. (see also chapter 3.6.1).

Verification method:	Raw data of the Excel sheet /2/ from the monitoring period were provided and checked by DNV. Random picked data points were checked against data stored on the monitoring PC.
Cross-check (if applicable)	The data are cross-checked with the flow measurement by a SRM during the QAL 2 test. Further the raw data were random checked as mentioned above following the DNV internal. procedure CDMJI – ICP-5-8-CDMJI-g13
QA/QC:	QAL2: 7 – 13 February 2008 (valid till 6 February 2013) /4/ AST: 10 – 11 June 2009 /5/ and 6 July 2010 (valid until 5 July 2011) /6/ The accuracy and the calibration interval of the monitoring equipment is in accordance with the relevant guidance of EB /32/ and is controlled and calibrated in accordance with the monitoring plan /3/.
Partial data (if applicable)	NA

Data variable	**TSG** Temperature in the stack gas	**Reported value for the project period** **NA**
Assessment/Observation		
Instruments and locations:	***Tag no. TE-120*** Stack temperature probe situated directly next to the volume flow meter, type PT100_385 3-wire RTD with transmitter Rosemont Model 644 RAI *Accuracy: 2.55% per QAL2* *Instrument number: NA*	

Accuracy:	The accuracy represents good monitoring practice, however it is not directly set in the PDD
Measuring and recording frequency:	**Measuring frequency:** Continuously **Recording frequency:** every 2 second
Calibration information	**Calibration frequency:** Internal calibration by AEL Ltd after each campaign, usually every 4 month /18/. External calibration: QAL2 by an authorized ISO 17025 institute every 5 year and AST by an authorized ISO 17025 institute annually **Latest date of calibration:** QAL2: 7 – 13 February 2008 (valid till 6 February 2013) /4/ AST: 10 – 11 June 2009 /5/ and 6 July 2010 (valid until 5 July 2011) /6/ **Validity of calibration:** the validity is 5 year for QAL2 and 1 year for AST **Company performing the calibration:** TÜV SÜD (QAL2) and Müller BBM (AST tests) **Did the calibration confirm proper functioning of monitoring equipment:** Yes The selected periods for individual tests represents good practice. No correction to the TSG data is necessary due to the delays between individual AST tests, since the combined error (incl. TSG and PSG) is applied to the normalised VSG data. DNV confirms that the calibrations are valid throughout the monitoring period and the delays in calibration were correctly addressed.
Information Flow:	The data are automatically stored in the SCADA Data Acquisition System. Once a month the results will be downloaded from SCADA to an excel file for analysis and calculation. The raw data will be saved on a DAT device and will be stored in a strongbox in the IT office. All data necessary for the emission reduction calculation are digitally transferred from the Plant data system (SCADA) to the dedicated relational database management system (N.DBMS). DNV confirms the successful verification of information flow of this parameter. (see also

	chapter 3.6.1).
Verification method:	Raw data of the Excel sheet /2/ from the monitoring period were provided and checked by DNV. Random picked data points were checked against data stored on the monitoring PC.
Cross-check (if applicable)	The data are cross-checked with the temperature measurement by a SRM during the QAL 2 test. Further the raw data were random check as mentioned above following the DNV internal. procedure CDMJI – ICP-5-8-CDMJI-g13
QA/QC:	QAL2: 7 – 13 February 2008 (valid till 6 February 2013) /4/ AST: 10 – 11 June 2009 /5/ and 6 July 2010 (valid until 5 July 2011) /6/ The accuracy and the calibration interval of the monitoring equipment is in accordance with the relevant guidance of EB /32/ and is controlled and calibrated in accordance with the monitoring plan /3/.
Partial data (if applicable)	NA

Data variable	**PSG** Pressure in the stack gas	**Reported value for the project period** **NA**
Assessment/Observation		
Instruments and locations:	***Tag no. PT-200*** Stack pressure probe situated directly next to the volume flow meter, type P type 3051Ta12B21BB4I1M5Q4 with transmitter Rosemont	

	Accuracy: 0.7% per QAL2 *Instrument number: 338640.1.1*
Accuracy:	The accuracy represents good monitoring practice, however it is not directly set in the PDD
Measuring and recording frequency:	**Measuring frequency:** Continuously **Recording frequency:** every 2 second
Calibration information	**Calibration frequency:** Internal calibration by AEL Ltd after each campaign, usually every 4 month /18/. External calibration: QAL2 by an authorized ISO 17025 institute every 5 year and AST by an authorized ISO 17025 institute annually **Latest date of calibration:** QAL2: 7 – 13 February 2008 (valid till 6 February 2013) /4/ AST: 10 – 11 June 2009 /5/ and 6 July 2010 (valid until 5 July 2011) /6/ **Validity of calibration:** the validity is 5 year for QAL2 and 1 year for AST **Company performing the calibration:** TÜV SÜD (QAL2) and Müller BBM (AST tests) **Did the calibration confirm proper functioning of monitoring equipment:** Yes The selected periods for individual tests represents good practice. No correction of the PSG data is necessary due to the delays between individual AST tests, since the maximum combined error (incl. TSG and PSG) is applied to the normalised VSG data. DNV confirms that the calibrations are valid throughout the monitoring period and the delays in calibration were correctly addressed.
Information Flow:	The data are automatically stored in the SCADA Data Acquisition System. Once a month the results will be downloaded from SCADA to an excel file for analysis and calculation. The raw data will be saved on a DAT device and will be stored in a strongbox in the IT office. All data necessary for the emission reduction calculation are digitally transferred from the Plant data

	system (SCADA) to the dedicated relational database management system (N.DBMS). DNV confirms the successful verification of information flow of this parameter. (see also chapter 3.6.1).
Verification method:	Raw data of the Excel sheet /2/ from the monitoring period were provided and checked by DNV. Random picked data points were checked against data stored on the monitoring PC.
Cross-check (if applicable)	The data are cross-checked with the pressure measurement by a SRM during the QAL 2 test. Further the raw data were random check as mentioned above following the DNV internal. procedure CDMJI – ICP-5-8-CDMJI-g13
QA/QC:	QAL2: 7 – 13 February 2008 (valid till 6 February 2013) /4/ AST: 10 – 11 June 2009 /5/ and 6 July 2010 (valid until 5 July 2011) /6/ The accuracy and the calibration interval of the monitoring equipment is in accordance with the relevant guidance of EB /32/ and is controlled and calibrated in accordance with the monitoring plan /3/.
Partial data (if applicable)	NA

Data variable	**OH_n** Total operating hours during each project campaign	**Reported value for the project period** PC5: 1 893 h PC6: 1 326 h PC7: 842 h

Assessment/Observation	
Instruments and locations:	NA – measured from Process Control System
Accuracy:	*NA*
Measuring and recording frequency:	**Measuring frequency:** Continuously **Recording frequency:** hourly
Calibration information	NA
Information Flow:	The hours are sourced from Process Control System DNV confirms the successful verification of information flow of this parameter. (see also chapter 3.6.1).
Verification method:	The data were re-calculated from raw data presented in excel sheet /2/
Cross-check (if applicable)	The data were re-calculated from raw data presented in excel sheet /2/
QA/QC:	NA
Partial data (if applicable)	NA

Data variable	**NAP** Metric tonnes of 100% concentrated nitric acid during each project campaign	**Reported value for the project period** PC5: 22 642.29 $tHNO_3$ PC6: 16 293.70 $tHNO_3$ PC7: 9 901.80 $tHNO_3$
Assessment/Observation		
Instruments and locations:	***Tag no. FT-111*** Coriolis mass flow meter Emerson MicroMotion CMF200 *Accuracy: ≤0.1%* *Instrument number: 12032709*	
Accuracy:	≤0.1%, which is fully in compliance with the PDD description and requirements of EN 14181	
Measuring and recording frequency:	**Measuring frequency:** Continuously, Concentration is determined by density and temperature **Recording frequency:** every hour	
Calibration information	**Calibration frequency:** 3 years **Latest date of calibration:** 24 February 2009 (valid until 23 February 2012) /17/ **Validity of calibration:** valid 3 years **Company performing the calibration:** ALPRET Controls Specialist /17/ **Did the calibration confirm proper functioning of monitoring equipment:** Yes. The PDD does not specify the frequency of calibration. The selected frequency represents good monitoring practice. DNV confirms that the calibration(s) is (are) valid throughout the monitoring period.	

Information Flow:	The data are automatically transferred and stored in the plant's process control system. All data necessary for the emission reduction calculation are manually transferred to the dedicated relational database management system (N.DBMS) and excel calculations spreadsheets. DNV checked the raw data from the PCS and no error was found. DNV confirms the successful verification of information flow of this parameter. (see also chapter 3.6.1).
Verification method:	Raw data of the Excel sheet /2/ from the monitoring period were provided and checked by DNV. Random picked data points were checked against data stored on the monitoring PC.
Cross-check (if applicable)	Raw data were random check as mentioned above following the DNV internal. procedure CDMJI – ICP-5-8-CDMJI-g13
QA/QC:	The calibration is realized every 3 years as was presented above /17/. The accuracy and the calibration interval of the monitoring equipment is in accordance with the relevant guidance and is controlled and calibrated in accordance with the monitoring plan.
Partial data (if applicable)	NA

Data variable	**CL_n** Length of each project campaign measured in metric tonnes of 100% concentrated nitric acid produced during that campaign	**Reported value for the project period** PC5: 22 642.29 $tHNO_3$ PC6: 16 293.70 $tHNO_3$ PC7: 9 901.80 $tHNO_3$
Assessment/Observation		
Instruments and locations:	***Tag no. FT-111*** Coriolis mass flow meter Emerson MicroMotion CMF200 *Accuracy: ≤0.1%* *Instrument number: 12032709*	
Accuracy:	≤0.1%, which is fully in compliance with the PDD description and requirements of EN 14181	
Measuring and recording frequency:	**Measuring frequency:** Continuously, Concentration is determined by density and temperature **Recording frequency:** every hour	
Calibration information	**Calibration frequency:** 3 years **Latest date of calibration:** 24 February 2009 (valid until 23 February 2012) /17/ **Validity of calibration:** valid 3 years **Company performing the calibration:** ALPRET Controls Specialist /17/ **Did the calibration confirm proper functioning of monitoring equipment:** Yes. The PDD does not specify the frequency of calibration. The selected frequency represents good monitoring practice. DNV confirms that the calibration(s) is (are) valid throughout the monitoring period.	

Information Flow:	The data are automatically transferred and stored in the plant's process control system. All data necessary for the emission reduction calculation are manually transferred to the dedicated relational database management system (N.DBMS) and excel calculations spreadsheets. DNV checked the raw data from the PCS and no error was found. DNV confirms the successful verification of information flow of this parameter. (see also chapter 3.6.1).
Verification method:	Raw data of the Excel sheet /2/ from the monitoring period were provided and checked by DNV. Random picked data points were checked against data stored on the monitoring PC.
Cross-check (if applicable)	Raw data were random check as mentioned above following the DNV internal. procedure CDMJI – ICP-5-8-CDMJI-g13
QA/QC:	The calibration is realized every 3 years as was presented above /17/. The accuracy and the calibration interval of the monitoring equipment is in accordance with the relevant guidance and is controlled and calibrated in accordance with the monitoring plan.
Partial data (if applicable)	NA

Data variable	**OP_h** Oxidation Pressure for each hour	**Reported value for the project period** **NA** (OP_h is measured to check if the parameter is within the permitted operating range during the baseline campaign or if the plant is out of operation during project campaigns)
Assessment/Observation		
Instruments and locations:	***Tag no. PT-100*** Yokogava press Tx – pressure transmitter *Accuracy: 1.7%* *Instrument number: 12C805780329*	
Accuracy:	NA	
Measuring and recording frequency:	**Measuring frequency:** Continuously **Recording frequency:**	
Calibration information	Every 6 month – 6 March 2009, 5 November 2009, 4 May 2010 and 28 August 2010 /18/	
Information Flow:	NA	
Verification method:	NA	
Cross-check (if applicable)	NA	

QA/QC:	NA
Partial data (if applicable)	NA

Data variable	**OT_h** Oxidation temperature in the ammonia oxidation reactor (AOR)	**Reported value for the project period** **NA (**OT_h is measured to check if the parameter is within the permitted operating range during the baseline campaign or if the plant is out of operation during project campaigns).
Assessment/Observation		
Instruments and locations:	***Tag no. TC102-A, TC102-B, TC102-C, TC102*** Thermocouple products, K-6 multipoints Thermocouple Assembly *Accuracy: 1%* *Instrument number: TP3138*	
Accuracy:	NA	
Measuring and recording frequency:	**Measuring frequency:** Continuously **Recording frequency:**	
Calibration information	Every 6 month – 6 March 2009, 4 November 2009, 4 May 2010 and 28 August 2010 /18/	

Information Flow:	NA
Verification method:	NA
Cross-check (if applicable)	NA
QA/QC:	NA
Partial data (if applicable)	NA

Data variable	**AFR** Ammonia gas flow rate to ammonia oxidation reactor (tNH_3/h)	**Reported value for the project period** **NA (**AFR is measured to check if the parameter is within the permitted operating range during the baseline campaign or if the plant is out of operation during project campaigns).
Assessment/Observation		
Instruments and locations:	***Tag no. FT-101*** Orifice plate type D/P *Accuracy: 1.25%* *Instrument number: 91H520733822*	
Accuracy:	NA	
Measuring and recording frequency:	**Measuring frequency:** Continuously **Recording frequency:** hourly	
Calibration information	Every 6 month – 6 March 2009, 5 November 2009, 4 May 2010 and 28 August 2010 /18/	
Information Flow:	NA	
Verification method:	NA	
Cross-check (if applicable)	NA	

QA/QC:	NA
Partial data (if applicable)	NA

Data variable	**AIFR** Ammonia to air ratio into the AOR	**Reported value for the project period** **NA (**AIFR is measured to check if the parameter is within the permitted operating range during the baseline campaign or if the plant is out of operation during project campaigns).
Assessment/Observation		
Instruments and locations:	calculated from AFR data (FT-101) and the primary airflow to the AOR (FT-100) FT100, Yokogawa D.P. transmitter Serial Number: F570EK384627	
Accuracy:	NA	
Measuring and recording frequency:	**Measuring frequency:** NA **Recording frequency:** hourly	
Calibration information	Every 6 month – 6 March 2009, 5 November 2009, 4 May 2010 and 28 August 2010 /18/	

Information Flow:	NA
Verification method:	NA
Cross-check (if applicable)	NA
QA/QC:	NA
Partial data (if applicable)	NA

Data variable	**$GS_{project}$** Gauze supplier for the project campaign	**Reported value for the project period** W.C.Heraeus (PC5, PC6, PC7)
Assessment/Observation		
Instruments and locations:	NA	
Accuracy:	*NA*	

Measuring and recording frequency:	**Measuring frequency:** NA **Recording frequency:** NA
Calibration information	NA
Information Flow:	NA
Verification method:	The supplier was confirmed from invoices /22/ and compared with information in the PDD /3/, validation report and previous verification report /7//8//23/. The records confirmed that the catalyst supplier is the same as in previous campaigns including baseline.
Cross-check (if applicable)	NA
QA/QC:	NA
Partial data (if applicable)	NA

Data variable	**$GC_{project}$** Gauze composition during the project campaign expressed as % by weight of the precious metals Pt, Rh and, if applicable, Pd comprising Amonia Oxidation Catalyst gauzes.	**Reported value for the project period** PC5: Pt (59%), Rh (4%), Pd (37%) PC6: Pt (59%), Rh (4%), Pd (37%) PC7: Pt (59%), Rh (4%), Pd (37%)

Assessment/Observation	
Instruments and locations:	NA
Accuracy:	*NA*
Measuring and recording frequency:	**Measuring frequency:** NA **Recording frequency:** NA
Calibration information	NA
Information Flow:	NA
Verification method:	The supplier was confirmed from invoices /22/ and compared with information in the PDD /3/, validation report and previous verification report /7//8//23/. The records confirmed that the catalyst supplier is the same as in previous campaigns including baseline.
Cross-check (if applicable)	NA
QA/QC:	NA
Partial data (if applicable)	NA

Data variable	**EF_{reg}** Emission cap for N_2O from nitric acid production set by government regulation	**Reported value for the project period** **No regulation**
Assessment/Observation		
Instruments and locations:	NA	
Accuracy:	*NA*	
Measuring and recording frequency:	**Measuring frequency:** NA **Recording frequency:** NA	
Calibration information	NA	
Information Flow:	NA	
Verification method:	Confirmed from database of QMS department, where legislation is monitored.	
Cross-check (if applicable)	NA	
QA/QC:	NA	

Partial data (if applicable)	NA

APPENDIX C

CURRICULA VITAE OF THE VERIFICATION TEAM MEMBERS

Zuzana Andrtová *holds Msc. Degree in Technology of Protection Environment on Prague's University of Chemical Technologies. Has more than 12 years experience with implementation of quality systems in various type of organizations. Her experience also covers machine technology design, analytical laboratory processes and implementation of environmental system.*

She has experience of 3 years in validation of CDM projects, determination and verification of JI projects in DNV and EU ETS verification as lead verifier. She participates as team member on accreditation audits for Czech Accreditation Institute as expert assessor for EU ETS scheme.

Her qualification, industrial experience and experience in CDM demonstrate her sufficient sectoral competence in Energy generation from renewable sources.

She has also been actively involved in Management System Audits such as ISO 9001, ISO 140001 and OHSAS 18001 standards in various industrial sectors for more than 5 years in DNV.

Torkjell Berge *holds a Master's Degree in Chemical Engineering with an overall experience of 36 years in industry. Prior to being engaged by DNV as an expert he had 29 years within the fertilizer industry as plant manager, project engineer and manager, research engineer and manager, and senior corporate technical staff member. In these positions a wide range of competencies has been developed. Out of these 29 years 14 has been within nitric acid production and research activities.*

In addition he has experience from melting industry being production responsible for the Rockwool insulation production in Norway for 7 years. In this process certain rock raw material is mixed with coke in a smelter to make rock fibres mainly used for building insulation.

Patrice Massicard *holds a Master degree in Mechanical Engineering. Having an overall experience of around 10 years. Prior to joining DNV, having around 3 years experience in Oil & Gas industry and 5 years experience in mechanical industry covering equipment design.*

He has experience of around 2 years in DNV for the certification of oil&gas processing equipments, and 2 years experience in the validation and verification of CDM projects.

His qualification, industrial experience and experience in CDM demonstrate him sufficient sectoral competence in the filed oil & gas and mechanical industries.

Rafi-ud-Din Khawaja *holds a Master's Degree in Environmental Engineering with over 8 years of experience in air pollution control technology, air pollution monitoring, risk management reviews (RMR), ambient air quality analysis (AAQA), transport phenomena, urban and industrial air quality management .*
He has acquired over four years of experience in validation and verification of numerous CDM and JI projects while working in DNV. He has been qualified as a CDM validator for technical area Renewables (hydro) and as a CDM validator/verifier as well as a Technical Reviewer (TR) for technical area N2O under the Qualification Scheme of Climate Change Services of DNV.
His qualification, industrial experience and experience in CDM facilitate him to assess all technical areas to sufficient degree.