



Industrie Service

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Verification Report

MGM Carbon Portfolio S.a.r.l.

3rd Periodic Verification of the Registered CDM Project
“Sasol Nitrous Oxide Abatement Project”
in South Africa

UNFCCC 0961-CDMP

Monitoring period #3: 10-08-2008 to 03-08-2009

Report No. 600500147

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TÜV SÜD Industrie Service GmbH
Carbon Management Service
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Subject:			Third Periodic Verification	
Executing Operational Unit:				
TÜV SÜD Industrie Service GmbH, Carbon Management Service Westendstrasse 199 - 80686 Munich, Federal Republic of Germany				
Project Participants:				
MGM Carbon Portfolio S.a.r.l. (5, rue Guillaume Kroll, L-1882 Luxemburg) Sasol Nitro (Nitrogen Road, Secunda, 2302, Mpumalanga, Republic of South Africa) Sasol Financing (Pty) Limited				
Registration number / Project Title		Project 0961: “Sasol Nitrous Oxide Abatement Project”		
Monitoring period:		10-08-2008 to 03-08-2009		
First Monitoring Report (version/date)		Version 01 / 25.03.2010		
Final Monitoring Report (version/date)		Version 5.0 / 04.01.2012		
Summary: TÜV SÜD Industrie Service GmbH has performed the 3 rd periodic verification of the registered CDM project: “Sasol Nitrous Oxide Abatement Project”. The project consists of the second catalyst installed to decompose N2O and AMS, Automated Measuring System to monitor the amount of N2O in the tail gas individually at 2 nitric acid plants in South Africa. Sasol Nitro as well as MGM Carbon Portfolio S.a.r.l. are responsible for the preparation of the GHG emissions data and the reported GHG emission reductions. A document review, followed by a site visit was conducted to verify the information submitted by the project participant regarding the present verification period. Based on the assessment carried out, the verifier confirms the following: - the project has been implemented and operated in accordance with the description given in the registered PDD (version 5, 31/01/2007, registration date 25/05/2007). - the project is implemented to create emission reductions in verifiable way in accordance with the monitoring plan described in PDD. - the monitoring plan complies with the applied methodology (AM0034 version 02) and the monitoring has been carried out in accordance with the monitoring plan. The verifier can confirm that the GHG emission reductions are calculated without material misstatements. Our opinion refers to the project’s GHG emissions and resulting GHG emission reductions reported, both determined using the valid and registered project’s baseline, its monitoring plan and its associated documents. Based on the information we have seen and evaluated, we confirm that the implementation of the project resulted in 489,639 t CO2e of emission reductions during the verification period from 10/08/2008 to 03/08/2009.				
Assessment Team Leader: Yutaka Yoshida Assessment Team Members: Yutaka Yoshida			Technical Reviewers: Martin Hammer Certification Body responsible: Thomas Kleiser	



Abbreviations

AM	Approved Methodology
AMS	Automated Measuring System as defined in AM0034
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB	CDM Executive Board
CER	Certified Emission Reduction
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CO₂e	Carbon dioxide equivalent
CR / CL	Clarification Request
DNA	Designated National Authority
DOE	Designated Operational Entity
EF	Emission Factor
EIA / EA	Environmental Impact Assessment / Environmental Assessment
EMS	Environmental Management system, typically in accordance with ISO14001
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse Gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
IRL	Information Reference List
KP	Kyoto Protocol
MGM	MGM Carbon Portfolio S.a.r.l.
MP	Monitoring Plan
MR	Monitoring Report
PDD	Project Design Document
QMS	Quality Management System, typically in accordance with ISO9001
SASOL	Sasol Nitro, a Division of Sasol Chemical Industries Limited.
PP	Project Participant
TÜV SÜD	TÜV SÜD Industrie Service GmbH
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

Main Documents (referred to in this report)

Methodology (name / version)	“Catalytic reduction of N ₂ O inside the ammonia burner of nitric acid plants” (AM0034, version 02)	
Scope	5	
Technical Area	5.1	
Registered PDD:	version 5, dated 31/01/2007	
Revised Monitoring Plan:	N/A	
	Version	Date
Published Monitoring Report	01	25.03.2010
Revised Monitoring Report	5.0	04.01.2012
Project documentation link:	http://cdm.unfccc.int/Projects/DB/DNV-CUK1171877538.97/view	

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Annex 1: Verification Protocol

Annex 2: Information Reference List

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1 INTRODUCTION

1.1 Objective

MGM Carbon Portfolio S.a.r.l. has commissioned an independent verification by TÜV SÜD Industrie Service GmbH (TÜV SÜD) of its registered CDM project: “Sasol Nitrous Oxide Abatement Project”.

The objective of the verification work is to comply with the requirements of paragraph 62 of the CDM Modalities and Procedures. According to this assessment TÜV SÜD shall:

- ensure that the project activity has been implemented and operated as per the registered PDD “Sasol Nitrous Oxide Abatement Project” version 5, dated 31/01/2007, and that all physical features (technology, project equipment, monitoring and metering equipment) of the project are in place,
- ensure that the published MR and other supporting documents provided are complete, verifiable and in accordance with applicable CDM requirements,
- ensure that the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology,
- evaluate the data recorded and stored as per the “Catalytic reduction of N₂O inside the ammonia burner of nitric acid plants” (AM0034, version 02).

1.2 Scope

The verification scope encompasses an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the Designated Operational Entity. The verification is based on the submitted monitoring report, the validated project design documents including its monitoring plan and validation report, the previous verification reports, the applied monitoring methodology, relevant decisions, clarifications and guidance from the CMP and the EB and any other information and references relevant to the project activity’s resulting emission reductions. These documents are reviewed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures and related rules and guidance.

Based on the requirements in the VVM, TÜV SÜD has applied a rule-based approach for the verification of the project. The principles of accuracy, completeness, relevance, reliability and credibility were combined with a conservative approach to establish a traceable and transparent verification opinion.

The verification considers both quantitative and qualitative information on emission reductions.

The verification is not meant to provide any consultancy towards the client. However, stated requests for clarifications, corrective and/or forward actions may provide input for improvement of the monitoring activities.

1.3 GHG Project Description

Project activity:	“Sasol Nitrous Oxide Abatement Project”
UNFCCC registration number:	0961
Project Participants:	MGM Carbon Portfolio S.a.r.l.; Sasol Nitro, a division of Sasol Chemical Industries Limited; Sasol Financing (Pty) Limited

Location of the project:	Sasolburg plant located in cnr Bunsen and Bergius street, Sasolburg 1974, (-26.825700°, 27.860150°), Free State, Republic of South Africa.
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PERIODIC VERIFICATION

“Sasol Nitrous Oxide Abatement Project” (0961)

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Secunda plant located in Sasol Nitro, Nitrogen Road,
Secunda, 2302 (-26.591889°, 29.182164°), Mpumalanga,
Republic of South Africa.

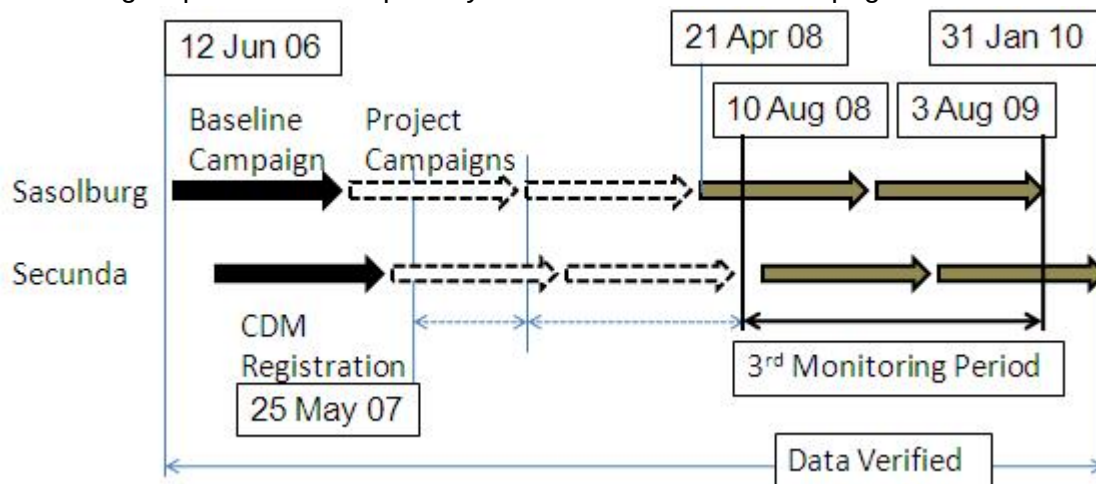
Date of registration: 25/05/2007
Starting date of the crediting period: 25/05/2007

The project activity involves the installation of a secondary catalyst to abate N₂O inside the ammonia burner once it is formed. Nitrous Oxide (N₂O) is an undesired by-product gas from the manufacture of nitric acid. Nitrous oxide is formed during the catalytic oxidation of Ammonia. Over a suitable catalyst, a maximum 98% (typically 92-96%) of the fed Ammonia is converted to Nitric Oxide (NO). The remainder participates in undesirable side reactions that lead to the production of Nitrous Oxide, among other compounds. Waste N₂O from nitric acid production is typically released into the atmosphere, as it does not have any economic value or toxicity at typical emission levels. N₂O is an important greenhouse gas which has a high Global Warming Potential (GWP) of 310.

As stated above, this project is to install the “additional” catalyst called the “secondary” catalyst which is dedicated to abate the concentration of N₂O in the tail gas. As it is not technically easy to make simultaneous measurement of N₂O concentration before & after such catalyst, i.e. baseline and project simultaneously, “baseline campaign” and “project campaigns” are separately done. Baseline Campaign is to be done without having secondary catalyst to determine “Baseline Emission Factor” (tN₂O/t100%HNO₃) which is supposed to be higher than one with the secondary catalyst. Then, Project Campaigns are to be done with secondary catalyst to determine “Project Emission Factor” (tN₂O/t100%HNO₃) which is supposed to be lower than “Baseline Emission Factor”. The difference will basically be “Emission Reductions” of each project campaigns in principle.

This project activity takes place at two nitric acid plants owned by Sasol Nitro, Sasolburg and Secunda respectively.

The project has been registered as CDM on 25 May 07 by UNFCCC. Prior to the registration at UNFCCC, the baseline campaigns had already been finished at both plants, from 12th June 2006 to 5th March 2007 at Sasolburg and from 29th August 2006 to 23rd March 2007 at Secunda. The first Monitoring Period was from the above day of CDM registration to 1st October 2007. And CERs have already been issued as a result of the last 2 periodic verification, i.e. the 1st & the 2nd periodic verification have already been finished. This 3rd verification has been done for the 3rd Monitoring Period from 10/08/2008 to 03/08/2009 since the 4th project campaigns at both plants have already been finished. Prior to starting this Verification, the Monitoring Report was made publicly available at UNFCCC webpage on 26th March 2010



2 METHODOLOGY

2.1 Verification Process

The verification process is based on the approach depicted in the Validation and Verification Manual.

Standard auditing techniques have been adopted for the verification process. The verification team performs first a desk review, followed by an on-site visit, which results in the formation of a protocol that includes all the findings. The next step involves the evaluation of the findings through direct communication with the PPs and then finally the preparation of the verification report. This verification report and other supporting documents then undergo an internal quality control by the CB “climate and energy” before submission to the CDM-EB.

2.2 Verification Team

The appointment of the verification team takes into account the technical areas, sectoral scope and relevant host country experience required amongst team members for verifying the ER achieved by the project activity in the relevant monitoring period for this verification.

The CB TÜV SÜD operates the following qualification levels for team members that are assigned by formal appointment rules:

- Assessment Team Leader (ATL);
- Verifier (V);
- Verifier Trainee (T);
- Technical Expert (TE).

The verification team consisted of the following members:

Name	Qualification	Coverage of scope	Coverage of technical area	Coverage of financial aspect	Host country experience
Yutaka Yoshida	ATL, V	☒	☒ (All)	-	☒

Technical reviewer:

- Martin Hammer

2.3 Review of Documents

The Monitoring Report version 01 submitted by the PP was made publicly available on the UNFCCC website before the verification activities started. The published MR was assessed based on all the relevant documents as listed above. The aim of the assessment in the desk review was to:

- verify the completeness of the data and the information presented in the MR,
- check the compliance of the MR with respect to the monitoring plan depicted in the registered PDD and verify that the applied methodology was carried out. Particular attention to the frequency of measurements, the quality of the metering equipment



including calibration requirements, and the quality assurance and quality control procedures was paid,

- evaluate the data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

A complete list of all documents reviewed is available in annex 2 of this report.

2.4 On-site Assessment and follow-up Interviews

On 11-13/05/2010 TÜV SÜD performed a physical site inspection at the both Secunda plant and Sasolburg plant, and on-site interviews with project stakeholders to:

- confirm the implementation and operation of the project,
- review the data flow for generating, aggregating and reporting the monitoring parameters,
- confirm the correct implementation of procedures for operations and data collection,
- cross-check the information provided in the MR documentation with other sources,
- check the monitoring equipment against the requirements of the PDD and the approved methodology, including calibrations, maintenance, etc.,
- review the calculations and assumptions used to obtain the GHG data and ER,
- identify if the quality control and quality assurance procedures are in place to prevent or correct errors or omissions in the reported parameters.

A list of the persons interviewed during this verification activity is included in annex 2.

2.5 Quality of Evidence to Determine Emission Reductions

Among several evidence items submitted, the following relevant and reliable evidence material have been used by the audit team during the verification process:

- QMS Documents prepared specifically for CDM activities including Overview Project Management, Responsibilities and document control procedures, List of measuring equipment and calibration frequencies, etc. for both Sasolburg and Secunda (IRL#22)
- Lists of monitoring equipment, specification (IRL#7)
- Internal/External Calibration Records (IRL#8, #9)
- Operation/Maintenance logs, Daily reports (IRL#12, #13)
- Various data including raw data as well as supplemental data to support the justification on the integrity of the data and/or for cross-checking (IRL#14, #15, #16)
- External documents used to prove for few parameters, e.g. gauze composition (IRL #16)
- Historic data/records/documents applied to determine caps or for applicability (IRL#18, #19)

Sufficient evidence covering the full verification period in the required frequency is available to validate the figures stated in the final MR. The source of the evidence will be discussed in chapter 3 of this report. Specific cross-checks have been done in cases that further sources were available. The monitoring report's figures were checked by the audit team against the raw data. The data collection system meets the requirements of the monitoring plan as per the methodology.



2.6 Resolution of Clarification and Corrective and Forward Action Requests

The objective of this phase of the verification process is to resolve any outstanding issues which require clarification for TÜV SÜD's positive conclusion of the achieved GHG emission reduction. The findings raised as Forward Action Requests (FARs) indicated in previous reports (validation) were discussed during this phase and, issues raised in the FARs were resolved, during communications between the PP and TÜV SÜD.

Concerns raised in the desk review, the on-site audit assessments and the follow up interviews and the responses provided for the raised concerns are documented in Annex 1 (verification protocol) to guarantee the transparency of the verification process.

A Corrective Action Request is raised where TÜV SÜD identifies:

- non-conformities in monitoring and/or reporting with the monitoring plan and/or methodology;
- that the evidence provided is not sufficient to prove conformity;
- mistakes in assumptions, data or calculations that impair the ER;
- FARs stated during validation that are not solved until the on-site visit.

A Clarification Request is raised where TÜV SÜD does not have enough information or the information is not clear in order to confirm a statement or data.

A Forward Action Request is raised where TÜV SÜD identifies that monitoring and/or reporting require special attention or adjustments for the next verification period.

Information or clarifications provided as a response to a CAR, CL or FAR could also lead to a new CAR.

2.7 Internal Quality Control

As a final step of verification, the final documentation including the verification report and annexes have to undergo an internal quality control by the Certification Body (CB) “climate and energy”, i.e. each report has to be finally approved either by the Head of the CB or the Deputy. In case one of these two persons is part of the assessment team, the approval can only be given by the person who is not a part of the assessment team. If the documents have been satisfactorily approved, the Request for Issuance is submitted to the CDM-EB along with the relevant documents.

3 VERIFICATION RESULTS

In the following sections, the results of the verification are stated. The verification results relate to the project performance as documented and described in the registered PDD (version 5, 31/01/2007, registration date 25/05/2007) and Monitoring Report Version 5.0, dated 04/01/2012. The verification findings for each verification subject are presented below:

3.1 FARs from Validation and the previous Verifications

No FAR was raised in the validation report and in the 1st & the 2nd verification reports <http://cdm.unfccc.int/Projects/DB/DNV-CUK1171877538.97/view> , and the verification team identified no material missing steps.

3.2 Project Implementation in accordance with the registered Project Design Document

The project is fully implemented according to the description presented in the registered PDD. The verifier confirms, through the visual inspection that all physical features of the proposed CDM project activity including data collecting systems and storage have been implemented in accordance with the registered PDD. The project activity is completely operational and the same has been confirmed on-site.

3.3 Compliance of the Monitoring Plan with the Monitoring Methodology

The monitoring plan is in accordance with the approved methodology, AM0034, version 02, applied by the proposed CDM project activity. Neither a revision nor a deviation to the monitoring plan has been requested to the CDM Executive Board.

3.4 Compliance of the Monitoring with the Monitoring Plan

The monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD. All parameters were monitored and determined as per the Monitoring Plan.

The verification of the parameters required by the monitoring plan is provided as follows:

Parameters based on metering devices are monitored by calibrated equipments in accordance with the procedures established as a part of Quality Management System for CDM monitoring activities, identified like SSBCDM-xxxx at Sasolburg and SECCDM-xxxx at Secunda.

At Sasolbug, All CDM data are monitored continuously on the DeltaV Distributed Control System (DCS) by production personnel in the Control Room. The Instrument Engineer will be responsible for the AMS, data gathering and report generation. Primary data storage is done in a PI database, which form an integral part of the DCS system, at two second intervals. Data are stored in batches of about six days, with only the last five months data continuously available on the DCS.

Scheduled backups of the last four batch files are made on a CD every 24 days and stored in a fireproof safe at the Ammonia plant. This data must be restored on the originating PI database before the data can be viewed or interrogated. With the completion of a campaign, data will be transferred from backup CD's to a DVD to minimize space requirements in the fireproof safe.



Data are also stored at 30 second intervals in a secondary database which form part of the Sasol Local Area Network and can be viewed from any LAN point. This second database can also be used for reporting should there be a major failure of the primary database

At Secunda, all CDM data are monitored continuously on the remote located PC (in the plant control room) via the SCADA INTOUCH and ACTIVE FACTORY software package by production personnel in the Control Room. The PC has access rights to the DAS server computer where the raw data from the instruments is written on a continuous basis. The Area Leader/Manager Maintenance - Engineer will be responsible for the AMS, data gathering and report generation. A daily summary report of hourly average data is generated by the DAS and a unique file is written to the common disk drive (analyzer Z:\) every morning at 05:00AM from where it can be viewed by selected personnel only, in this case the Monitoring Engineer and the Plant production Area leader. This file is safeguarded as read only and cannot be modified or changed as only the third party consultant who developed the DAS and AMS has the password to bypass the safeguarding and access the file for modification. All raw data written to the server hard disk drives, which are setup up using five identical hard disk drives in parallel service is available at any time and can be written to DVD format and forwarded to any party concerned.

Data / Parameter:	Volume Flow Rate of the Stack in the Baseline Measurement Period, VSG
Data unit:	Nm ³ /hour
Description:	Mean gas volume flow rate in the stack gas
Source of data used:	Volume flow rate of the stack gas is continuously measured with Rosemount 485 Annubar a pressure differential type gas flow meter at Secunda and an ultrasonic type Flowsick 100 at Sasolburg and is continuously recorded on DCS/DAS.
Means of verification/Comments:	To comply with EN14181(2004,) QAL2 and ASTs were successfully done since 18-22 February 2007 by an accredited laboratory SGS Environmental Service. UNC as the total (combined) uncertainty on AMS at Sasolburg has been determined to be +/-3.89% at Sasolburg and +/-4.14% at Secunda in the QAL2 report. In addition, AST was successfully done by SGS in 08-12 August 2008 and 27-29 August 2009 and these AST reports explicitly confirm that the previous QAL2 result has still been maintained and that the current QA/QC procedures implemented complies with EN14181. i.e. The purpose of ASTs were successfully fulfilled and the conformance with EN14181 maintained has been confirmed by the accredited laboratory. And thus, UNC as well as the correction factors determined at the 1st QAL2 is considered still valid for this monitoring period. Since SGS as QAL2/AST provider is neither the validator nor the verifier, there is no conflict to the decision of CDM EB stated at the paragraph 13 in EB33 report. The measured data are automatically converted to the normalized data at 0 °C, 0.101Mpa (standard atmospheric pressure) with the real-time conversion incorporated in the pressure transmitter at Secunda and the algorithm incorporated in DCS at Sasolburg. This algorithm/function used to make the real time conversion with temperature and pressure data are verified with the specification documents (IRL #6, #7). In addition, QAL2/AST were done with the normalized data between these flow meters installed at both plants and the reference flow meter temporarily installed by SGS. The verifier has verified the integrity and the consistency of the series of the hourly data from various point of view, e.g. with the graphical analysis and the comparison among them, checks on the data processing/algorithm incorporated, checks on the default/maximum/minimum/average values applied, cross checking with other reports, the compliance to MP and AM0034, etc. For an instance, abnormal data, i.e. data measured during the time period which is and can be considered as "AMS downtime" have correctly been converted to



	conservative values in accordance with AM0034, e.g. lowest between the last measured and the conservative IPCC default for baseline campaign and the highest value for the entire length of a project campaign. The verifier has concluded that the data and the result are sufficiently reliable and comply with the applied methodology as well as the monitoring plan stated in PDD registered. In addition, in accordance with QAL2 report, the flow rate is calculated on dry basis on the fixed and conservative assumption that the moisture contents would always be 2% in the tail gas, while actual moisture contents was also stated “very low” in the QAL2 report so that the verifier can consider the 2% assumption conservative.
Cross-check	In order to ensure the integrity of the data, the verification team reviewed the series of hourly data in parallel with other parameters including to make a graph with the Excel file calculation sheet submitted. And there was no abnormality found as a result.

Data / Parameter:	Temperature of the Stack Gas, TSG
Data unit:	°C
Description:	Temperature of the stack gas
Source of data used:	This is measured with PT100 at the both plants, a typical resistance thermometer incorporated in the flow rate measurement to normalize the result of the measurement.
Means of verification/Comments:	As QAL2 and AST are done on the normalized data, this element has been maintained together with VSG and PSG. The recording frequency of every 2 seconds is verified with the real-time raw data displayed on the screen when the verifier visited the plants.
Cross-check	Graphical check was done on VSG data and no abnormality was found.

Data / Parameter:	Pressure of the Stack Gas, PSG
Data unit:	kg/cm ²
Description:	Pressure in the stack gas
Source of data used:	Static pressure of the tail gas is measured with one of functions of the above flow rate measurement to normalize the result of the measurement at the both plants.
Means of verification/Comments:	As QAL2 and AST are done on the normalized data, this element has been maintained together with VSG and TSG. The recording frequency of every 2 seconds is verified with the real-time raw data displayed on the screen when the verifier visited the plants.
Cross-check	Graphical check was done on VSG data and no abnormality was found. In addition, although these values were small compared to the standard atmospheric pressure is 0.101 MPa, they are not considered abnormal as both Sasolburg and Secunda are located in highland.

Data / Parameter:	N ₂ O Concentration in the Stack Gas, NCSG
Data unit:	mg N ₂ O/Nm ³ (converted from ppm if necessary)
Description:	Mean concentration of N ₂ O in the stack gas
Source of data used:	At both Sasolburg and Secunda plants, N ₂ O concentration in the stack gas is continuously measured with ABB AO2000-URAS 14, a QAL 1 certified infrared gas analyser and is continuously recorded on DCS/DAS.



Means of verification/Comments:	To comply with EN14181(2004), QAL2 and ASTs were successfully done since 18-22 February 2007 by an accredited laboratory SGS Environmental Service. UNC as the total (combined) uncertainty on AMS at Sasolburg has been determined to be +/-3.89% at Sasolburg and +/-4.14% at Secunda in the QAL2 report. In addition, AST was successfully done by SGS in 08-12 August 2008 and 27-29 August 2009 and these AST reports explicitly confirm that the previous QAL2 result has still been maintained and that the current QA/QC procedures implemented complies with EN14181. i.e. The purpose of ASTs were successfully fulfilled and the conformance with EN14181 maintained has been confirmed by the accredited laboratory. And thus, UNC as well as the correction factors determined at the 1st QAL2 is considered still valid for this monitoring period. Since SGS as QAL2/AST provider is neither the validator nor the verifier, there is no conflict to the decision of CDM EB stated at the paragraph 13 in EB33 report. QAL3, particularly Zero/Span check on N2O analyzer has punctually been maintained at Sasolburg, however there were long vacancy of Zero/Span check at Secunda as well as malfunctioning (CAR #3). To comply with CAR #3, the time period of malfunctioning where the measured data can be considered defective and possibly defective have been identified as "AMS downtime". In addition, for the period where the regular Zero/Span check were missing, "Guidelines for assessing compliance with the Calibration Frequency Requirements, version 01 (Annex 60, EB52)" has been correctly applied in accordance with the opinion of SGS Environmental Service
Cross-check	In order to ensure the integrity of the data, the verification team reviewed the series of hourly data in parallel with other parameters included to make a graph with the Excel file calculation sheet submitted. And there were several abnormality found like CAR #3 and CAR#6 raised about abnormality observed during the 3rd and the 4th project campaigns at Sasolburg. Although there were additional fluctuation of NCSG observed in the 4th project campaign at Secunda, it was settled after the repair of Lamont boiler (AOR) done on 09-10 Sep. 2009. And thus, these fluctuated values are considered real as QAL3 implementation was also sound.

Data / Parameter:	Operating Hours, OH
Data unit:	Hour
Description:	Total operating hours for a campaign
Source of data used:	While the applied methodology specifies "production log" and "daily" for this parameter, Sasol uses one determined based on the measured data as the source to be precise. I.e. Sasol is counting hours in which the hourly average of the reactor temperature is above 650 °C during each campaigns. On the other hand, Sasol continues to maintain a hand writing operation log which is to be used for cross checking purpose in case of any unexpected failure on the data logging system.
Means of verification/Comments:	OH values have been determined sufficiently in transparent and conservative way in the spreadsheet and there was no inconsistency found in comparison to the information recorded in operation logs, except the inconsistency raised in CAR #1 which has been fixed.
Cross-check	The graphs of daily HNO3 production were compared to the graphs of other parameters, e.g. NH3 supplied to check the similarity.

Data / Parameter:	Overall Uncertainty of the Monitoring System, UNC
Data unit:	%

Description:	Overall uncertainty of the monitoring system, calculated as the combined uncertainty of the applied monitoring equipment
Source of data used:	Measured by QAL2 test
Means of verification/Comments:	UNC as the total (combined) uncertainty on AMS at Sasolburg has been determined to be +/-3.89% at Sasolburg and +/-4.14% at Secunda in the QAL2 report.
Cross-check	N/A

Data / Parameter:	Nitric Acid Production, NAP
Data unit:	tonne 100% HNO ₃
Description:	Total nitric acid production for a campaign
Source of data used:	The total amount of nitric acid (100% concentrated) produced during baseline campaigns and project campaigns, using Coriolis type mass flow meters at both plants, promass 83 at Secunda and Micro Motion at Sasolburg, in addition to daily concentration measurement at internal laboratories.
Means of verification/Comments:	The daily amount of nitric acid produced have been submitted in the CERs calculation spreadsheets so that the verifier could check the consistency compared to the other related parameters, e.g. ammonia input as mentioned below. The total nitric acid production during the 3rd and the 4th project campaign at Sasolburg were 121,814 t100%HNO₃ (231 days) and 122,293 t100%HNO₃ (236 days). During this monitoring period from 10/08/2008 to 03/08/2009, the total nitric acid produced was 186,141 t100%HNO₃ (=63,848+122,293) which is equivalent to 519 t100%HNO₃/day and apparently less than the design capacity 557 t100%HNO₃/day as the applicable limit at Sasolburg. With regard to Secunda, the total nitric acid production during the 3rd and the 4th project campaign were 156,596 t100%HNO₃ (239 days) and 195,398 t100%HNO₂ (275 days). During this monitoring period from 10/08/2008 to 03/08/2009, the total nitric acid produced was 210,049 t100%HNO₃ (=156,596+53,453) which is equivalent to 585 t100%HNO₃/day and apparently less than the design capacity 860 t100%HNO₃/day at Secunda.
Cross-check	These values are cross-checked by Sasol with the data from other sources, i.e. the production balance data based on storage tank level measurement and delivery data from the weighbridges. These cross-check data are reviewed daily and monthly in the reports to monitor the production results and the production efficiency as one of Sasol's usual activities. In addition to this cross-checking data/reports, the verifier has also checked the shape of the graphs in comparison to one of ammonia supply and N ₂ O data in order to ensure the consistency and the integrity.

Data / Parameter:	N ₂ O Emission Factor, EF
Data unit:	tonne N ₂ O/tonne 100% HNO ₃
Description:	The emission factor is calculated from monitored data for a campaign.
Source of data used:	Calculated from monitored data
Means of verification/Comments:	This has been calculated based on the measured data of applicable parameters. The elimination of N ₂ O data in relation to the permitted operating range, the elimination of the data that lie outside the 95% confidence interval, the application of AMS downtime and UNC determined based on QAL2 report have been correctly applied in the Excel file (IRL #14)



	Since CDM Executive Board published the new decision to clarify the way of the re-calculation of the baseline emission factor in relation to the length of campaigns in Annex 12 of EB51 report, the baseline emission factor for the 3rd project campaign at Secunda has been recalculated to comply with it. In addition, the requirements about moving average in AM0034 have correctly been applied.
Cross-check	N/A

Data / Parameter:	Oxidation Temperature for Each Hour, OT _h
Data unit:	°C
Description:	Oxidation temperature of the ammonia reactor for each hour
Source of data used:	Oxidation temperature is continuously measured with thermo-couples and transducer, ENDRESS & HAUSER iTEMP TMT 181 at Sasolburg and Honeywell ST3000 at Secunda.
Means of verification/Comments:	To comply with the requirement of the methodology applied, hourly data have been provided in the calculation spreadsheets and the range of variation during baseline campaign has been analyzed comparing to permitted operating conditions determined based on the historic data at Sasolburg and based on the specification at Secunda (IRL #18, #19) as mentioned about operating conditions below. For project campaigns, this parameter is not required to be monitored in AM0034 version 2 while the series of hourly data as the monitoring results have been submitted in the spreadsheets of each project campaign.
Cross-check	As mentioned above, the verification team reviewed the series of hourly data in parallel with other parameters including to make graphs with the Excel file calculation sheet submitted. There was no abnormality found.

Data / Parameter:	Oxidation Pressure for Each Hour, OP _h
Data unit:	Pa abs
Description:	Oxidation pressure of the ammonia reactor for each hour
Source of data used:	Oxidation pressure is continuously measured with the pressure transducers, Rosemount Smart pressure transmitter model 3051 at Sasolburg and Honeywell ST3000 at Secunda.
Means of verification/Comments:	To comply with the requirement of the methodology applied, hourly data have been provided in the calculation spreadsheets and the range of variation during baseline campaign has been analyzed comparing to permitted operating conditions determined based on the specification at both plant (IRL #18, #19) as mentioned about operating conditions below. For project campaigns, this parameter is not specified to be monitored in AM0034 version 2 while the series of hourly data as the monitoring results have been submitted in the spreadsheets of each project campaign.
Cross-check	As mentioned above, the verification team reviewed the series of hourly data in parallel with other parameters including to make graphs with the Excel file calculation sheet submitted. There was no abnormality found.

Data / Parameter:	Ammonia Gas Flow Rate to AOR, AFR
Data unit:	kg NH ₃ /hour
Description:	Ammonia flow rate to the ammonia oxidation reactor for the baseline campaign



Source of data used:	Ammonia gas flow rate to the AOR is continuously measured with orifice and the differential pressure transmitter, Rosemount 3051 at Sasolburg and Honeywell ST3000 at Secunda, calibrated annually.
Means of verification/Comments:	To comply with the requirement of the methodology applied, hourly data have been provided in the calculation spreadsheets and the range of variation during baseline campaign has been analyzed comparing to permitted operating conditions determined based on the specification of the gauze at both plants (IRL #14). For project campaigns, this parameter is not specified to be monitored in AM0034 version 2 while the series of hourly data as the monitoring results have been submitted in the spreadsheets of each project campaign.
Cross-check	As mentioned above, the verification team reviewed the series of hourly data in parallel with other parameters including making graphs with the Excel file calculation sheet submitted, especially to compare with nitric acid production. There was no abnormality found.

Data / Parameter:	Ammonia to Air Ratio, AIFR
Data unit:	(kg NH ₃ /kg air)
Description:	Ammonia to air flow ratio to the ammonia oxidation reactor for the baseline campaign
Source of data used:	Air flow to the mixer is continuously measured with Rosemount Annubar at Sa-solburg and orifice/Honeywell ST 3000 at Secunda, calibrated annually.
Means of verification/Comments:	To comply with the requirement of the methodology applied, hourly data have been provided in the calculation spreadsheets and the rate AFR divided by hourly air flow is provided in an additional column. And the range of variation during baseline campaign has been analyzed comparing to permitted operating conditions determined based on the specification of the gauze at both plants (IRL #18, #19) as mentioned about operating conditions below. For project campaigns, this parameter is not specified to be monitored in AM0034 version 2 while the series of hourly data as the monitoring results have been submitted in the spreadsheets of each project campaign.
Cross-check	As mentioned above, the verification team reviewed the series of hourly data in parallel with other parameters including making graphs with the Excel file calculation sheet submitted. There was no abnormality found.

Data / Parameter:	Campaign Length for Baseline Campaign, CL
Data unit:	tonne 100% HNO ₃
Description:	Campaign length is defined as the total number of tonnes of nitric acid at 100% concentration produced with one set of gauzes (see nitric acid production, NAP).
Source of data used:	The same as NAP. The total amount of nitric acid (100% concentrated) produced during baseline campaigns and project campaigns, using Coriolis type mass flow meters at both plants, promass 83 at Secunda and Micro Motion at Sasolburg, in addition to daily concentration measurement at internal laboratories.
Means of verification/Comments:	The normal campaign lengths verified at the previous verification are 114,727 t100%HNO ₃ at Sasolburg and 183,602 t100%HNO ₃ at Secunda. The lengths of all project campaigns except the 3 rd project campaign at Secunda were longer than the normal length. Therefore, the baseline emission factor of the 3 rd project campaign at Secunda has correctly been



	re-calculated to comply with both the applied methodology and Annex 12 of EB51 report.
Cross-check	These values are cross-checked by Sasol with the data from other sources, i.e. the production balance data based on storage tank level measurement and delivery data from the weighbridges. These cross-check data are reviewed daily and monthly in the reports to monitor the production results and the production efficiency as one of Sasol's usual activities. In addition to this cross-checking data/reports, the verifier has also checked the shape of the graphs in comparison to one of ammonia supply and N ₂ O data in order to ensure the consistency and the integrity.

Data / Parameter:	Gauze Supplier, GS
Data unit:	N/A
Description:	Gauze supplier
Source of data used:	purchasing documents (IRL #16) issued by Heraeus SA (PTY) Ltd
Means of verification/Comments:	No change since historic campaigns. The historically used gauze composition has been confirmed with the letters named “Precious Metal Contents” sent from Heraeus in 2006. And the continuation of using the same products have been verified with the purchasing documents (IRL #16) issued by Heraeus SA (PTY) Ltd. every campaigns in which the specification including the name of the products and the weight % of the platinum, Rhodium and Palladium are explicitly indicated.
Cross-check	None

Data / Parameter:	Gauze Composition, GC
Data unit:	% precious metals (platinum, rhodium)
Description:	Gauze composition
Source of data used:	purchasing documents (IRL #16) issued by Heraeus SA (PTY) Ltd
Means of verification/Comments:	No change since historic campaigns. The historically used gauze composition has been confirmed with the letters named “Precious Metal Contents” sent from Heraeus in 2006. And the continuation of using the same products have been verified with the purchasing documents (IRL #16) issued by Heraeus SA (PTY) Ltd. every campaigns in which the specification including the name of the products and the weight % of the platinum, Rhodium and Palladium are explicitly indicated.
Cross-check	None

Data / Parameter:	Emission Level Set by Incoming Policies or Regulations, EF _{reg}
Data unit:	kg N ₂ O/tonne HNO ₃
Description:	Local and national regulations on N ₂ O and NO _x emissions
Source of data used:	Local and national regulations
Means of verification/Comments:	No applicable legislative requirement introduced in the host country. This complies with the knowledge and experience of the verification team.
Cross-check	None

3.5 Assessment of Data and Calculation of Greenhouse Gas Emission Reductions

Quality assurance procedures are in place and operational. All involved staff is trained and made aware of the quality assurance procedures.

Sasol has described key positions and roles in the applicable QMS documentation, typically in "Description of personnel involved in the CDM Project activities, SSBCDM-0010" for Sasolburg and "People involved in the CDM project activities at the plant, SECCDM-0005" for Secunda. These procedures include organization charts indicating hierarchical responsibilities from Plant Operator or from Area Managers to Senior Management or to Shareholders for Sasol, as well as descriptions about such responsibilities.

As raw data is automatically logged in the data acquisition system (hereinafter called "DAS" or "DCS"), plant operators or area managers are to supervise such system in cooperation with monitoring engineers. At both plants, Monitoring engineers have some administrative tasks like entering data into spread sheets and cross checking. The lists of key monitoring equipment for CDM activities have been established to ensure the conformance with the plan, and calibration is carried out and reported in a part of overall QMS certified with ISO 9001.

As a partner for this CDM project, MGM is supposed to be a "Project Developer" which is stated in above procedures, and is to receive above spread sheets from Sasol to process the data measured, to calculate and finally to issue a monitoring report.

The verification team reviewed the CERs calculation spreadsheet in Excel files provided by MGM which is the final outcome to determine the baseline and project emissions. These Excel files consists of both raw and "processed" hourly and daily data, so that the verification team could easily check how raw data were processed and easily create graphs to see the graphical overview. CAR#1 was an instance of which the abnormality was found in the graphical analysis in relation to the vacancy of QAL3 at Secunda, although such peculiarity should ideally be recognized by Sasol/MGM themselves when they issue MR & spreadsheet.

As the result, the verifier has had the confidence that the CERs calculation spreadsheet provides correct ways of treating data in very transparent manner, including the treatment related to "AMS downtime", determination of emission factors, re-calculation of baseline emission factor, ERs calculation, cap with moving average.

With regard to the comparison of ERs verified and estimated in PDD, the annual average emission reductions estimated in PDD registered, version 5 from 31/01/2007 are 515,837 tCO₂e/year at Sasolburg, 444,485 tCO₂e/year at Secunda and 960,322 tCO₂e/year in total. Compared, 489,639 tCO₂e has been achieved for this monitoring period from 10-08-2008 to 03-08-2009, for nearly 1 year. Therefore Sasol has made approx. 50% of the estimated annual ERs, approx. 89% at Sasolburg and approx. 7% at Secunda. One of the main reasons observed by the verifier is very poor and unstable performance of the secondary catalyst at Secunda as there were periods where N₂O concentration was kept very high and the secondary catalyst did not seem to work at all in addition to the problems on N₂O analyzer (CAR#3). As a result, the emission factor of the 3rd project campaign 0.00426 tN₂O/tHNO₃ was just a little less than the re-calculated baseline emission factor 0.00448 tN₂O/tHNO₃ and one for the 4th project campaign 0.00326 tN₂O/tHNO₃ was not much less than the baseline emission factor 0.00457 tN₂O/tHNO₃.

4 SUMMARY OF FINDINGS

The verifier can confirm that the published MR and related documents are complete and verifiable in accordance with the CDM requirements. All the findings including 8 CARs and 17 CRs raised by the verification team, the responses by the PPs and the conclusion from the team are presented in Annex 1. The means of verification and resulting changes in the MR or related documents are identified in the following table:

CAR 1: Many shutdown happened are presented in GSP version of MR. In addition, 2 tables are presented as the lists of events including shutdowns, i.e. tables titled “Operation Logbook” and tables titled “AMS logbook” however what are written are not consistent at all. Not understandable why shutdowns had to be separated to 2 tables for 1 identical project campaign at 1 identical plant. Particularly, it is not possible for the verifier to verify the correctness of OH determination including the consistency to the plant operation logs.
CAR 1, means of verification “AMS logbook” was correctly “ANS logbook” issued at the next process and was found to be not applicable to the nitric acid plants. They were written in MR just by mistake. B.1. section of MR has been revised to present the tables of events in accordance with Operation Logbook. The consistency between OH determined and operation logs submitted has successfully been verified.
CAR 1, changes in the MR or related documents MR has correctly been revised

CAR 2: MR states “(wet basis)” as for the tail gas flow measurement. This can be confusing to explain what is done in the emission reduction calculation while the “physical” measurement itself is done on wet basis. As AST report clearly states, the adjustment factor as the result of QAL2/AST was determined assuming 2% moisture in the stack gas conservatively in order to provide the measured VSG values on dry basis, as the final outcome. Although immediate measurement is done on wet basis, all measured values are correctly converted to values conservatively on “dry basis” in accordance with QAL2 and then they are applied in the emission reduction calculation.
CAR 2, means of verification The description has been revised in MR. In accordance with AST report issued by SGS Environmental Service, the sample gas is fed to the N2O analyzer via “Flue gas treatment filters, cooler” and thus NCSG is measured on dry basis. And the correction factor of the tail gas volume flow measurement determined in the QAL2 report has correctly been applied to all the raw data conservatively to have the tail gas volume flow data on dry basis. Therefore the measurement is done consistently on dry basis at both Secunda and Sasolburg plants.
CAR 2, changes in the MR or related documents MR has correctly been revised to reflect the current condition.

**CAR 3:**

There were periods at Secunda for which the credibility of NCSG values needed to be justified.

- A) Although "analyser faulty" was recorded for 1-6th Jan. 09 in the operation logbook, there is no applicable treatment done in the calculation spreadsheet.
- B) Moreover, there is no further information other than "analyser faulty" about one during 1-6th Jan. 09, i.e. no information about what kind of problems specifically happened, when & how & by whom they were fixed, what evidence is available to justify the end of the problems, what was the date about when the malfunctioning was likely to start happening, how the start date can be justified. In fact, NCSG indicate sudden rise from 29th December to 06th Jan. 09, not from 1st Jan. 09 as far as the verifier makes graphical analysis. As ERs calculation is made on hourly basis, please specify the hours of malfunctioning with objective evidences. And please revise the spreadsheet accordingly.
- C) There were missing Zero/Span checks frequently although the frequency is defined to be weekly internally by Sasol. As at least every 3 weeks was the recommendation of the manufacture, occasional missing is not likely to increase the risk. However there were long vacancies found in Shewhart chart, e.g. no Zero/Span checks after 25th Aug. 08 until 1st Dec.08 (for more than 3 months.), missing after 29th Dec. 08 until 20th Jan. 09 (In fact, NCSG values fluctuated during this period.) This means that QAL3 has not been appropriately maintained at all at Secunda, specially during the 3rd project campaign. And thus the verifier can not immediately accept the overall credibility of NCSG data without having sufficient justification particularly for long vacancies. Although AST report issued by SGS Environmental Service does not raise this problem, Sasol is expected to obtain expert's opinion about these vacancies

By the way of clarifying the above issue with the accredited laboratory please clarify the meaning of the 1st paragraph in the Remark of "Summary and conclusion" page, "During the 4th campaign the values in the Shewhart chart of Secunda are obtained from the sample gas this should be reference gas before calibration." Since this sentence could mean wrong procedures of Zero/Span checks taken at Secunda.

CAR 3, means of verification

The periods where the credibility of measured data of N₂O concentration was not reasonably justifiable have been identified based on the maintenance logs and ABB's report.(IRL#12) And AMS downtime has correctly been applied to those periods, e.g. the period from 1st – 6th Jan. 2009 has been considered as AMS downtime and the highest NCSG value for the entire 3rd project campaign was applied.

For the period where Zero/Span check was considered overdue, the conservative treatment has been applied based on the opinion of QAL2/AST provider, SGS Environmental Service (IRL#12) which is consistent to Guidelines for assessing compliance with the Calibration Frequency Requirements, version 01 (Annex 60, EB52). E.g. For the period from the start of the 3rd project campaign in Aug. 2009 to 1st Dec. 2009, 4.42% which was the deviation found at the late Zero check done on 1st Dec. 2009 as "the error identified in the delayed calibration test if beyond the maximum permissible error(=3.82%)" was applied to NCSG values to increase project emissions.

With regard to the sentence of SGS, "During the 4th campaign the values in the Shewhart chart of Secunda are obtained from the sample gas this should be reference gas before calibration.", the verifier did not find any wrong procedure or data. And the QAL3 data is considered sound as there was no defect found in the recorded data in QAL3 in which both N₂O concentration of reference gas and actual measured data were correctly recorded.



CAR 3, changes in the MR or related documents

MR, spreadsheet have correctly been revised

CAR 4:

Please correct the typo in the monitoring report where "SICK FLOWSIC 100" is stated as the stack gas flowmeter at Secunda although it is Rosemount Annubar.

CAR 4, means of verification

This was just a typo in MR.

CAR 4, changes in the MR or related documents

MR has been revised.

CAR 5:

At the previous verifications, the verifier agreed that no particular maintenance including calibration on the Coriolis type flowmeter was required in accordance with the letter from the manufacture in which only appearance inspection is recommended. However the calibration frequency at Sasolburg is still stated "Yearly". And, contradictory, "Previous calibration date" is stated as "Dec 2009" which is more than 1 and half year after "Last calibration date" Apr 2008. Please clarify with evidences about if "yearly" calibration is necessary at Sasolburg. And please submit a calibration record made "Apr 2009".

CAR 5, means of verification

Letter from the supplier Endress Hauser affirms no special maintenance such as calibration required for Coriolis type flowmeters (nitric acid) but recommends only appearance inspection. Sasolburg still calibrate transmitters which is a part of Coriolis type flowmeters. Although "Yearly" does not mean annual full-calibration, i.e. not entire function of flowmeter, this is still more than the recommendation of the supplier and complies with the statement in PDD "Critical instruments are calibrated on a routinely basis according to the quality assurance system of the plant (ISO 9001)."

In fact, transmitter failed before April 2009 and was replaced from previous one (Serial NO. 3747530 in the calibration record on 11/04/2008) to the current one (Serial NO.11035097 in the calibration record on 23/10/2009)). This was the reason why there was the 1.5 years vacancy of calibration between 2008 and 2009. The verifier has accepted this as a new equipment is assured for the initial performance with the inspection at manufacture as the common industrial practice.

CAR 6, changes in the MR or related documents

N/A

CAR 6:

In the spreadsheets of the 3rd and 4th project campaigns at Sasolburg, following abnormalities are found

- 1) There are sudden negative values of N₂O concentration, e.g. 30 April '08, 01 May '08, 06 May '08, 06 Jan '09. And few of them are included in the calculation while negative values should be treated as apparent abnormality. Please investigate reasons why this could happen, in order to identify the period of the abnormality. And please apply "AMS downtime" for the periods identified as abnormal.

Please clarify if -111.4 ppmv as the deviation found at Span check done on 1 Jun 2009 and



198.0 ppmv on 20 Feb '09 are within the control limit or not. If not, please apply the way of correction instructed by QAL2/AST provider SGS.

CAR 6, means of verification

All negative values observed in the third project campaign at Sasolburg have been considered abnormal and the highest value in the entire project campaign has conservatively been applied to all applicable hours as AMS downtime. The reason why negative values suddenly appear and disappear was mostly due to maintenance while S_{AMS} (standard deviation defined in EN14181) for zero point determined by ABB is 20.96mg/m³, drifting 2 sigma i.e. -41.92 mg/m³ (-21.3ppmv) or occasional drift within 3 sigma can still happen statistically as QAL3 is maintained with 2 sigma in accordance with EN14181. (That is probably why UNC is considered in CERs calculation in accordance with AM0034.)

And where significant deviations were found at Zero or Span checks (if exceeds the control limit +/- 2 SAMS defined in EN14181, values measured for the last span of Zero/Span check have been corrected in accordance with SGS, QAL2/AST provider. What was done is identified in "Special consideration" sheet in the calculation spreadsheet of Sasolburg 4th project campaign.

CAR 6, changes in the MR or related documents

MR, spreadsheet have correctly been revised.

CAR 7:

MR has to provide the same level of information required in the new monitoring report template publicized at EB54

http://cdm.unfccc.int/Reference/PDDs_Forms/Issuance/iss_form05_v01.doc, e.g. "Location of the project activity" including GPS coordinates of both plants, the same level of information on "Data and parameters monitored", "Comparison of actual emission reductions with estimates in the CDM-PDD" and "Remarks on difference from estimated value in the PDD"(if increased)

CAR 7, means of verification

MR has been completed using the new MR template.

CAR 7, changes in the MR or related documents

MR has been completed using the new MR template.

CR 1: Secunda has provided the daily cross-checking result between the mass-balance data and "meter reading" the data measured with the flow meter in the list, in which the daily differences are indicated.

1. In the calculation spreadsheet, the daily production of nitric acid is stated to be 695.56 t100%HNO₃ while the "CDM Mass Balance.xls" provides 1,169 as Meter Reading and 1,303.8 as Mass Balance data on 31st August '08. And the check result is indicated as "ERROR". Please clarify how 695.56 has been chosen in this circumstances.
2. There are considerable number of ERRORS indicated in "CDM Mass Balance.xls" including 119.6% ERROR on 1st Jul. '09, 107.2% ERROR on 24th Jul. '09 and 107.6% ERROR on 31st Dec. '09. Please clarify how these 3 extreme values took place. Please explain how each ERROR is treated to determine daily NAP.
3. If most of ERROR are not real ERROR e.g. due to the timing difference of the determination of daily mass-balance, such frequent daily ERRORS' ON/OFF look very noisy to discuss the overall credibility of Meter Reading data. If possible, please provide the cross-checking results for longer spans, e.g. monthly comparison.



CR 1, means of verification
The figure 1169 ton was the mass of the produced nitric acid, expressed as diluted acid. The acid strength for that day was 59.5%. Those numbers gave the value of 695.56 ton of 100% HNO₃. For 1st July'09 – Daily production reports are generated automatically and for this day there was a problem with the printer and there was no printout to show the amount of acid produced. Therefore, people responsible for developing the Mass Balance used the production figure corresponding to 30th June 2009, in order to perform the calculation. That was the reason of the big difference observed. For 24th July 09 and 31st December 09 there were no records of the amount of acid used at AN plant and hence the Mass Balance contains empty cells in column C. 3- CDM mass balance on monthly basis was sent to the auditor after the site visit.
CR 1, changes in the MR or related documents
The verifier confirmed no extreme difference in the cross-checking result and has been given consistent reasons about above cases. As the short term variation of daily mass-balance can happen commonly in this industry, the similarity of the cross-checking data for longer term is important. Monthly cross-checking data of which the average was 3.6% and the biggest monthly difference 9.2% has been considered reasonable as the balance data is determined with the tank level, amount fed to Ammonia Nitrate, amount dispatched for which we cannot technically expect very precise measurement.
CR 2:
About Sasolburg, no cross-checking record about nitric acid produced has been provided in order to ensure the credibility of “Meter Reading” data.
CR 2, means of verification
“NO_x Week Report” issued by Sasolburg in which columns F (actual production) and G (mass balance) present the nitric acid cross-checking data has been submitted. No abnormality is found in any data for days of normal operation.
CR 2, changes in the MR or related documents
No change was needed.
CR 3:
No evidence about Gauze composition used for the 3rd and the 4th project campaigns since such evidence was not provided during the on-site visit. (For Sasolburg, a report from Heraeus South Africa, titled “Re: Fixed rate for 20th FTCPlus campaign” dated 16th May 2010 has been submitted.)
CR 3, means of verification
The report for both 15th and 16th campaign for the 3rd and the 4th project campaigns has been submitted to demonstrate no change on the gauze composition as well as the supplier of the primary catalyst at Secunda plant.
CR 3, changes in the MR or related documents
N/A



5 VERIFICATION STATEMENT

TÜV SÜD Industrie Service GmbH has performed the third periodic verification of the CDM project: "Sasol Nitrous Oxide Abatement Project". The verification is based on the currently valid documentation of the UN Framework Convention on Climate Change (UNFCCC).

The management of Sasol and MGM are responsible for the preparation of the GHG emissions data and the reported GHG emission reductions on the basis set out within the project's Monitoring Plan indicated in the registered PDD version 5, dated 31/01/2007 and the applied methodology AM0034, version 02

The verifier can confirm that:

- the development and maintenance of records and reporting procedures are in accordance with the registered monitoring plan;
- the project is operated as planned and described in the project design document approved by the EB;
- the installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately;
- the monitoring system is in place and generates GHG emission reductions data;
- the GHG emission reductions are calculated without material misstatements;
- the monitoring plan in the approved PDD is as per the applied methodology.

Our opinion is based on the project's GHG emissions and resulting GHG emission reductions reported, which have been both determined through the valid and registered project's baseline, its monitoring plan and its associated documents.

Based on the information we have seen and evaluated, we confirm the following statement:

Reporting period: from 10-08-2008 to 03-08-2009

Verified emissions in the above reporting period:

Baseline emissions:	851,828	t CO ₂ e
Project emissions:	362,189	t CO ₂ e
Leakage emission:	0	t CO ₂ e
Emission reductions:	489,639	t CO ₂ e

Munich, 17-01-2012

A blue ink signature of Thomas Kewer, written in a cursive style.

Certification Body "climate and energy"
TÜV SÜD Industrie Service GmbH

Munich, 17-01-2012

A black ink signature of Yutaka Yoshida, written in a cursive style.

Yutaka Yoshida
Assessment Team Leader

PERIODIC VERIFICATION

“Point of Use Abatement Device to Reduce SF₆ emissions in LCD Manufacturing Operations in the Republic of Korea (South Korea)” (3440)



Industrie Service

Annex 1: Verification Protocol

Verification Protocol

Project Title: "Sasol Nitrous Oxide Abatement Project" – (0961)

Date of Completion: 17/01/2012

Number of Pages: 1 / 55



Industrie Service

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Verification Protocol

Project Title: "Sasol Nitrous Oxide Abatement Project" – (0961)

Date of Completion: 17/01/2012

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Industrie Service

1. Project Activity Implementation

1.1. Technology

Project Location (s)			
	PDD Description	Verification Findings(or Results?)	Conclusion and IRL
Site Description / Address:	The project activity is located at two nitric acid plants owned by Sasol. The smaller unit (557 tonne per day) is located in Sasolburg and the other nitric acid plant (860 tonne per day) in Secunda. Address: Sasolburg and Secunda, Free State and Mpumalanga provinces, Republic of South Africa	The location is correctly but just roughly stated in the PDD. The address is as follows. Sasolburg: cnr Bunsen and Bergius street Sasolburg 1974. Secunda: Sasol Nitro, Nitrogen Road, Secunda, 2302	☒ IRL #0
GSP coordinates:	Not stated	Sasolburg: S26°49.542' E027°51.609' Secunda : 26°35'30.80"South, 29°10'55.79"East Checked with Google Earth	☒
Technical Equipment – Main Components			
	PDD Description	Verification Findings(or Results?)	Conclusion and IRL
Equipment Description Component 1 (the overall configuration of the nitric acid plant including Ammonia Oxidization Reactor): Technical Features	Sasol Nitro (hereinafter called "Sasol") is a division of Sasol Chemical Industries Limited, a private company incorporated under the laws of the Republic of South Africa. Sasol Chemical Industries Limited is part of the Sasol group of companies (the Sasol Group) whose activities are coordinated by the holding company Sasol Limited, founded in 1950. The Sasol Group is an integrated oil and gas entity with substantial chemical interests. It is based in South Africa with its head office in Johannesburg, but also has manufacturing and marketing facilities elsewhere in Africa, Europe,	The project is fully implemented according to the description presented in the PDD. The verifier confirms, through the visual inspection that all physical features of the proposed CDM project activity including data collecting systems and storage have been implemented in accordance with the registered PDD. The project activity is completely operational and the same has been confirmed on-site. As described in the figure 5 in the page 12 of	☒ IRL #0, #2

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Asia and the Americas. Sasol is listed on the Johannesburg Securities Exchange (JSE), symbol SOL, and the New York Stock Exchange (NYSE), symbol SSL. Sasol Chemical Industries Limited represents the Sasol Group's chemicals businesses with its portfolio including polymers, solvents, olefins, surfactants, waxes, phenolics and nitrogenous products. Sasol Nitro, a division of Sasol Chemical Industries Limited, represents the nitrogenous products and related goods; it manufactures and markets ammonia, nitric acid, fertilizers, phosphoric acid, a phosphoric detergent, commercial explosives and specialized blasting accessories. The division also markets ammonia, sulfur and specialty gases produced by other Sasol divisions. Sasol Nitro operates two nitric acid plants.

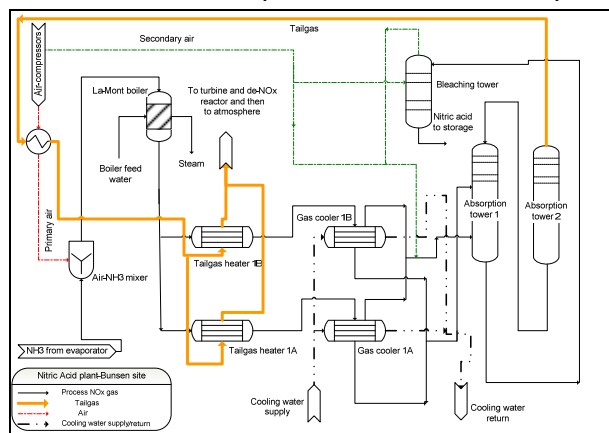
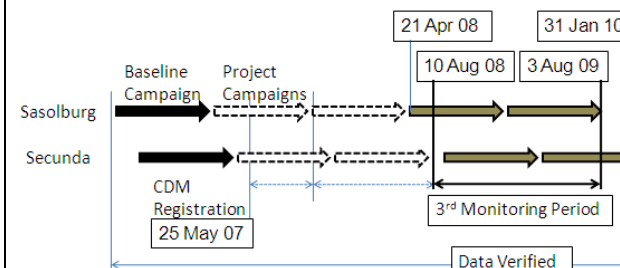


Figure 1. Project boundary for Sasolburg nitric acid plant

The smaller 557 ton 100% nitric acid per day unit in Sasolburg is linked to a downstream ammonium ni-

PDD for Sasolburg and in the figure 6 in the page 13 of PDD for Secunda, each plant consists of 1 Ammonia Oxidization Reactor (AOR) called “La-Mont boiler”. The campaign length is similarly 8 months at both plants.



The crediting period started as soon as the project was registered at UNFCCC, after the completion of baseline campaign. Since the 1st project campaign started prior to the registration of this CDM project, initial emission reductions made before the date of the registration has been eliminated after the determination of the project emission factor using the data measured during the entire period of the 1st project campaign. I.e. emission reductions has been calculated based on the amount of nitric acid produced after the start of the crediting period, using emission factor determined based on the entire data of the project campaign. The verifier has accepted this approach since the way of calculation exactly follows one specified in the applied methodology with no deviation. This approach has already applied at the 1st and the 2nd verification of this project and CERs has been issued.

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trate plant. The ammonium nitrate is processed in Sasolburg to produce low density ammonium nitrate for use in the production of commercial explosives.

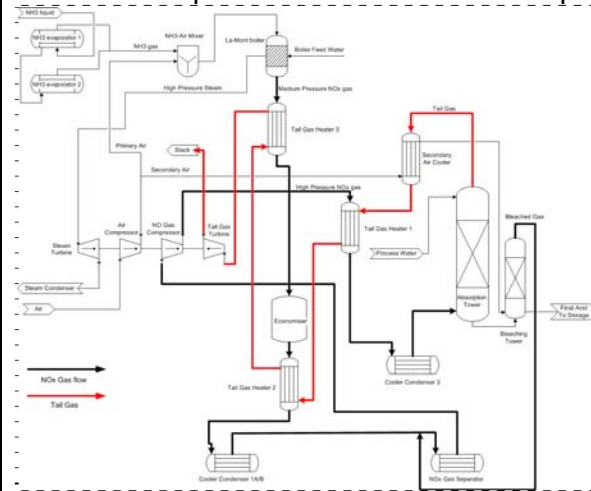


Figure 2. Project boundary for Secunda nitric acid plant

The larger 860 ton per day unit in Secunda supplies a downstream ammonium nitrate plant linked to a 500,000 ton per annum fertilizer granulation facility that produces limestone ammonium nitrate (LAN) and various other fertilizer grades containing nitrogen, phosphorus and potassium. Ammonium nitrate for industrial use is sourced from both sites.

No data and/or variables presented in the MR differ significantly from the stated in the registered PDD, which would to cause an increment of the ER in this period or in future periods in relation to the estimates in the registered PDD.

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Component 2 (Ammonia Oxidization Reactor): Technical Features	Sasol Nitro operates two nitric acid plants. The smaller 557 ton 100% nitric acid per day unit in Sasolburg is linked to a downstream ammonium nitrate plant. The ammonium nitrate is processed in Sasolburg to produce low density ammonium nitrate for use in the production of commercial explosives. The larger 860 ton per day unit in Secunda supplies a downstream ammonium nitrate plant linked to a 500,000 ton per annum fertilizer granulation facility that produces limestone ammonium nitrate (LAN) and various other fertilizer grades containing nitrogen, phosphorus and potassium. Ammonium nitrate for industrial use is sourced from both sites.	To ensure the conformity with the conditions of "Applicability" specified in the methodology about "designed capacity" of nitric acid production at 2 plants at the end of 2005, an environmental certificate for continuing plant operation and design documents were successfully verified. For Sasolburg, the letter titled as "Re:Notes on 1973 design and test run data, Sasol HNO3 plant in Sasolburg, South Africa" dated 13 September 2006 provides the plant capacity data including old record as attachment made by Uhde, saying 522 ton 100% per day as the designed guaranteed minimum capacity and 556.8 ton 100% per day as demonstrated capacity in November 1973. For Secunda, the latest certificate with regard to atmospheric pollution, "Registration in terms of the Atmospheric Pollution Prevention ACT, 1965(ACT 45 of 1965)" dated on 04.Jan 1999 for the nitric acid processes is stating 860 t 100%HNO3/d which is consistent to one in PDD.	IRL #10 CR #1
Component 2 (Primary Gauze): Technical Features	Both Sasol plants have a Raschig ring bed as part of the support/homogenization system on their oxidation reactors. Due to its high degree of selectivity (towards N2O decomposition) the depth of the secondary catalyst bed to be installed is only a few centimetres thick, much thinner than the actual Raschig ring bed. To create space to insert the new catalyst, enough layers of Raschig rings will be removed from the basket. The precious metal coated ceramic pieces (the secondary catalyst) will come inside a cage of Kanthal or Megapyr steel (same material used for separating	Gauze Compositions, GCnormal are consistent with a specification including one for historic campaigns, called "Precious Metal Contents" provided by Heraeus, dated Nov 22, 2006. Both plant use FTCplus however the composition used has been slightly different between 2 plants and such difference is also stated in the specification consistently to PDD. For Sasolburg plant, the letter from Heraeus titled "Re: Indicative costing for 16th FTCplus campaign" dated 10 January, 2008 states "indic-	☒ IRL #11

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	screens on the primary gauze pack) to secure even distribution of the pieces over the cross section area of the reactor. The outside rim of the caged catalyst is sealed with the reactor walls, in order to avoid any bypassing of the N₂O rich gases. Once the secondary catalyst is installed, the primary gauzes are placed on top of the basket, as usual. Then, the secondary catalyst acts as support system for the primary gauze pack and both catalysts are in close contact. Sasol uses the Heraeus FTC-system as primary catalyst which is a fully integrated catalytic package made of PGM alloys using the knitting technique. Each package is designed individually for the reactor and consists of different welded layers of HA- and FTC-gauzes. GS_{normal} : W.C. Heraeus for both plants GC_{normal} for Secunda: Pt 54.0 to 55.0 %, Rh 3.5 to 3.8 %, Pd 41.0 to 43.0 % GC_{normal} for Sasolburg: Pt 54.0 to 56.0 %, Rh 3.6 to 3.9 %, Pd 40.0 to 42.0%.	ative costing for the campaign starting about 2nd October 2007" in the table. 5th -8th as full FTC campaigns, 9th – 14th as FTCPlus campaigns and 15th – 16th as projected campaigns. For Secunda plant, the letter from Heraeus titled "Re: 14th campaign -210 days – fixed rate" indicates actual history for 4th -12th (12th as the baseline). In accordance with these record as well as photos of gauzes installation is considered sufficient to prove that whole set of the primary catalyst was renewed at start of the baseline campaign at both Sasolburg and Secunda.	
Operation Status during verification			
	Verification Findings	Conclusion and IRL	
Approvals / Licenses	Operation Permit of Nitric Acid plant at Sasolburg with regard to Atmospheric Air Pollution Prevention Act, 1965 issued by Department of Environmental Affairs and Tourism, issued on 28th December 2004 (IRL#21) and "Registration in terms of the Atmospheric Pollution Prevention ACT, 1965(ACT 45 of 1965)" dated on 04.Jan 1999 for the nitric acid processes as the latest certificate with regard to atmospheric pollution at Secunda (APPA permit, IRL #21) are explained to be the evidences as the permission of the plant operation given by the environmental authority. The APPA permit is still the latest certificate that Secunda has; Sasol Nitro has submitted the application	☒ IRL #21	

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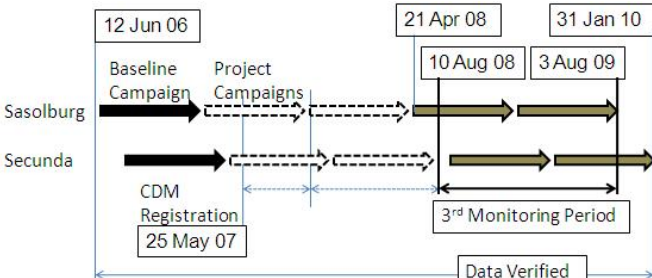
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	to The Department of Environmental and Tourism in terms of the Air Quality Act and is still awaiting the issuance of a new permit. The permit is expecting to be issued in 2011. The APPA permit issued in 2004 for Sasolburg plant is still valid.	
Actual Operation Status	This project has been registered at UNFCCC http://cdm.unfccc.int/Projects/DB/DNV-CUK1171877538.97/view since 25 May 2007 and the crediting period has started on the same day, after the end of baseline campaign on 5 March 2007 at Sasolburg and on 23 March 2007 at Secunda.  The on-site visit was done on 11 – 13 May 2010 while the 5th project campaign were being operated at both plants (but was about to end at Sasolburg.) Start date of the plant operation: nitric acid production has been operated since 1973 at Sasolburg and 1984 at Secunda. Under construction : AMS was installed at the end of 2005 at Sasolburg and during August 2006 at Secunda. In operation :The project has been operated since the start of baseline campaign on 12/06/2006 at Sasolburg and on 29/08/2006 at Secunda. Out of operation : Many shutdown happened are presented in GSP version of MR. In addition, 2 tables are presented as the lists of events including shutdowns, i.e. tables titled "Operation Logbook" and tables titled "AMS logbook" however what are written are not consistent at all. Not understandable why shutdowns had to be separated to 2 tables for 1 identical project campaign at 1 identical plant. Particu-	☒ IRL #0, #2

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	larly, it is not possible for the verifier to verify the correctness of OH determination including the consistency to the plant operation logs. Therefore CAR#1 was raised as follows; <u>Corrective Action Request #1.</u> 1) About one for Secunda, 1-A) OH determination is explained to be made based on the daily operation log considering the operation of ammonia supply to the reactor. Then, please submit the applicable daily operation logs specially for days when the measured data were missing in the calculation spreadsheets, e.g. 19th Nov. '08, 22nd Dec. '08, 11th Jan. '09, 16th Jan. '09, 18th Jan. '09, 06-07th Feb. '09, 17th Mar. '09, 31st Mar. '09, 6th Apr. '09, 09th Apr. '09, 25th Apr. '09 for the 3rd project campaign and 06th May '09, 27-28th Jun. '09, 09-10th Aug. '09, 20th Sep. '09, 06th Jan. '10 for the 4th project campaign. 2) For Sasolburg 1-A) In general, the data including NCSG are much more stable at Sasolburg and Shewhart chart looks sound compared to the defective QAL3 implementation at Secunda. On the other hand, ways how OH has been determined would be clarified. Because, while the monitoring report provides "Annex 4 – Relevant event summary Sasolburg plant", in which shutdowns of the plants due to various specific reasons are reported, there are inconsistencies found particularly about OH among "NOx logbook", "AMS logbook" and the calculation spreadsheet. ① Please clarify the reasons why Sasolburg maintains and provides 2 sources, i.e. "NOx logbook" and "AMS logbook". Because values of "Lost time" are frequently different between these 2 sources about each event. And thus it looks confusing. ② As far as the verifier analyze the information as attached "Events&OH_3rd_Sasolburg.xls", OH values in the calculation spreadsheet which have been used to determine emission reductions are the most conservative, e.g. at least 17.77 hrs. more conservative than either one in "NOx logbook" or "AMS logbook" in total for the entire 3rd project campaign. And therefore daily inconsistency about each events in 2 logbook do not need to be considered a problem as long as OH determination has been made consistently to the source used, i.e. daily operation log considering the operation of ammonia supply. Then, please provide daily operation logs which are applicable to the days of events.	
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	At the moment of writing the PDD the concept of starting date of the project activity was not defined as it is now. Then, the date which was used as the starting date of the project activity was the date in which the project was supposed to start reducing emissions. Since Sasolburg plant started the first project campaign before than Secunda plant, the estimated date of the beginning of first project campaign at Sasolburg was used as the starting date of the project activity (01/03/2007). The actual date of the beginning of first project campaign at Sasolburg plant was 07/03/2007.	☒ IRL #5
Remarks on Special Operational Circumstances During the Verification Period	[Historic Campaigns & Permitted Operating Ranges] The permitted operating range for OT at Sasolburg was correctly determined based on the data recorded for 5 consecutive historic campaigns before baseline campaign (IRL #19) while the permitted operating conditions of all the rest at Sasolburg and Secunda were consistently determined based on Uhde's old Technical Document and confirmation letters from Uhde as well as from Heraeus, due to no availability of hourly data recorded during historic campaigns, i.e. no hourly data recorded in hand writing logs and the record retention period stipulated previously to be 6 months only at Secunda. (IRL #16, 19) Gauze composition used during historic campaigns were verified with the letter titled "fixed rate" issued at every campaign by Heraeus South Africa for both Sasolburg and Secunda. (IRL #16, 19)	☒ IRL #16, #19

1.2. Organization

Project Participant (s)		
	Verification Findings	Conclusion and IRL
Entity / Responsible person:	Sasol Nitro, Secunda South Africa / Mr. PN Venter, Quality Manager MGM, Argentina / Mrs María Inés Hidalgo, Chemical Team Director	☒ IRL #0
CDM Project management:	PDD describes the hierarchical structure of the monitoring activities as well as the quality management system in Annex 4 of PDD registered.	☒ IRL #0

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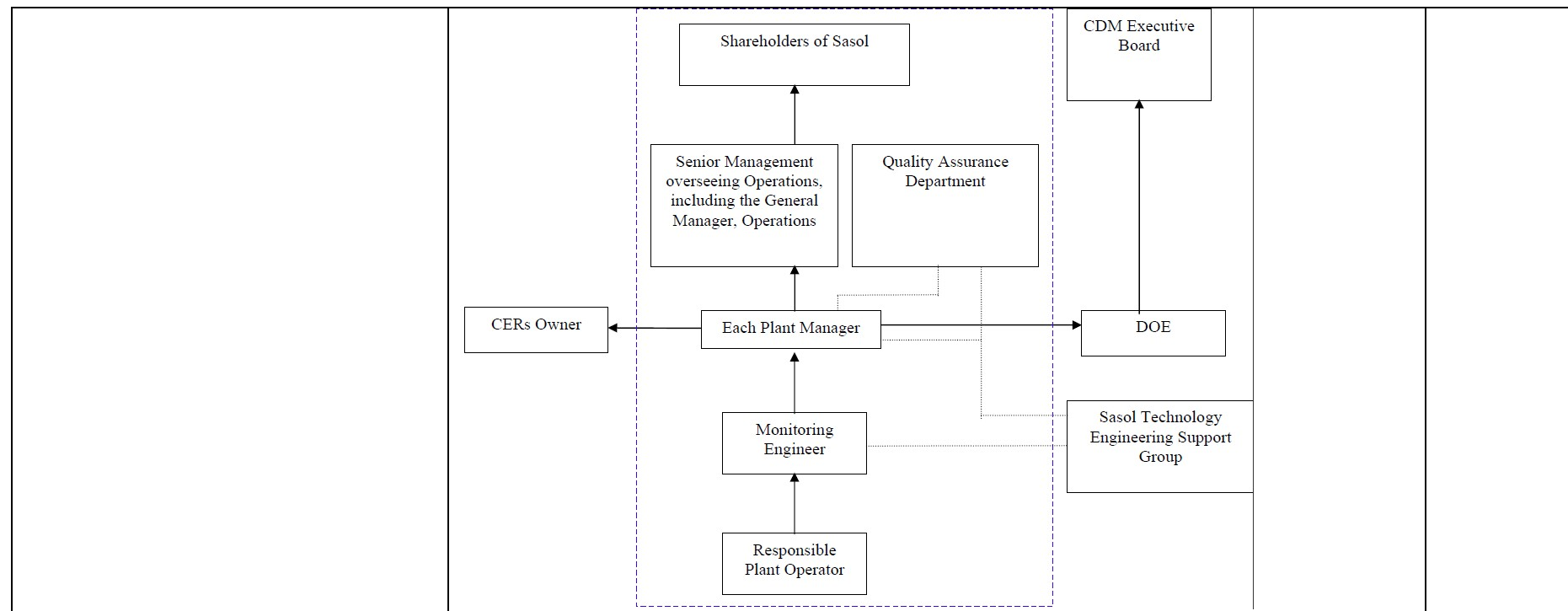
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1.3. Quality Management System

General aspects of the Quality Management System		
	Verification Findings	Conclusion and IRL
Quality Management Manual:	Sasol Nitro Sasolburg has maintained the certification of ISO 9001- 2008 issued by "DQS GmbH Deutsche Gesellschaft zur Zertifizierung von Managementsystemen" for the scope "The manufacture and supply of ammonia, specialty gases, specific explo-	☒ IRL #22

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	sives and fertiliser product for both the local and selected export markets". At the both Sasolburg and Secunda, the overall QMS certified with ISO 9001:2008 covers CDM activities. In addition to existing procedures, several additional procedures have been developed specifically for CDM activities. Therefore the data or records are basically managed in their quality management system.	
QM Implementation:	Quality assurance procedures are in place and operational. All involved staff is trained and made aware of the quality assurance procedures. Sasol has described key positions and roles in the applicable QMS documentation, typically in "Description of personnel involved in the CDM Project activities, SSBCDM-0010" for Sasolburg and "People involved in the CDM project activities at the plant, SECCDM-0005" for Secunda. These procedures include organization charts indicating hierarchical responsibilities from Plant Operator or from Area Managers to Senior Management or to Shareholders for Sasol, as well as descriptions about such responsibilities. As Raw data is automatically logged in the data acquisition system (hereinafter called "DAS" or "DCS"), plant operators or area managers are to supervise such system in cooperation with monitoring engineers. At both plants, Monitoring engineers have some administrative tasks like entering data into spread sheets and cross checking. The lists of key monitoring equipment for CDM activities have been established to ensure the conformance with the plan, and calibration is carried out and reported in a part of overall QMS certified with ISO 9001. As a partner for this CDM project, MGM is supposed to be a "Project Developer" which is stated in above procedures, and is to receive above spread sheets from Sasol to process the data measured, to calculate and finally to issue a monitoring report. The data treatment of the Daily Events was checked by the verifier with intense awareness. It can be confirmed by the verifier that all data were treated according to the implemented routines and found to be correct. All quality control procedures established are functional and able to detect and correct inconsistencies or abnormality.	☒

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1.4. Outstanding FARs from previous Verifications (or forwarded issues from the validation report)

Outstanding Requests from Previous Verifications	Summary of project owner response	Audit team Conclusion and IRL
No FAR raised in validation report And there is no previous verification	N/A	N/A

2. Monitoring Plan Implementation

2.1. Parameters

Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
NCSG N ₂ O concentration in the stack gas (mgN ₂ O/m ³ (converted from ppm if necessary))	NCSG N ₂ O concentration in the stack gas (mgN ₂ O/m ³ (converted from ppm if necessary))	NCSG N ₂ O concentration in the stack gas (mgN ₂ O/m ³ (converted from ppm if necessary) (wet basis))	2.2 Table 1	NCSG is measured with ABB AO2040 at both Sasolburg and Secunda plants. Calibration has been done and maintained with QAL2, QAL2 and AST to comply with EN14181.	☑ IRL #0, #2
VSG Volume flow rate of the stack gas (m ³ /h)	VSG Volume flow rate in the stack gas (Nm ³ /h)	VSG Volume flow rate in the stack gas (Nm ³ /h (wet basis))	2.2 Table 2	<u>Corrective Action Request #2.</u> Please delete "(wet basis)" stated in the Monitoring Report as this can be confusing to explain what is done in the emission reduction calculation while the measurement itself is done on wet basis.	☑ IRL #0, #2

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Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
				As AST report clearly states, the adjustment factor as the result of QAL2/AST was determined assuming 2% moisture in the stack gas conservatively in order to provide the measured VSG values on dry basis, as the final outcome. Although immediate measurement is done on wet basis, all measured values are correctly converted to values conservatively on dry basis and then they are applied in the emission reduction calculation.	
BE _{BC} Total N ₂ O for baseline campaign (tN ₂ O)	BE _{BC} Total baseline emissions in the baseline measurement period (tN ₂ O)	BE _{BC} Total N ₂ O for the baseline campaign (tonne N ₂ O)	No, as this is calculated	In compliance	☑ IRL #0, #2
PE _n N ₂ O emissions of nth project campaign (tN ₂ O)	PE _n Total Project emissions of the nth campaign (tN ₂ O)	PE _n N ₂ O emissions of project campaign (tonne N ₂ O)	No, as this is calculated	In compliance	☑ IRL #0, #2
OH Operating hours (Hours)	OH Total operating hours (Hours)	OH Total operating hours (Hour)	No, as this is calculated	As the registered monitoring plan in PDD states "Process control system of Sasolburg and Secunda plants" as the source of this parameter, Sasol does not use their hand writing daily operation logs but	CAR #1

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Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
				precisely determines operating hours based on the process data measured. Sasol is counting hours in which the hourly average of the reactor temperature is above 650 °C during each campaigns. On the other hand, Sasol continues to maintain a hand writing operation log which is to be used for cross checking purpose in case of any unexpected failure on the data. However there were possible inconsistency found. Please see <u>Corrective Action Request #1</u>	
NAP Nitric Acid production (100% concentrate) (tHNO ₃)	NAP Total nitric acid production (ton 100% HNO ₃)	NAP Total nitric acid production (tonne 100% HNO ₃)	2.2 Table 3	The total amount of nitric acid (100% concentrated) produced during baseline campaigns and project campaigns, using Coriolis type mass flow meters at both plants, promass 83 at Secunda and Micro Motion at Sasolburg, in addition to daily concentration measurement at internal laboratories.	☑ IRL #0, #2
TSG Temperature of stack gas	TSG Temperature of stack gas (°C)	TSG Temperature of stack gas (°C)	Stated together with VSG at section 2.2, Table 2	TSG is measured with thermocouple type K at Sasolburg and Pt100 at Secunda, incorporated in the tail gas flow meter. Calibration has been done together with the flow meter at QAL2/AST	☑ IRL #0, #2
PSG	PSG	PSG	Stated together with VSG at section	PSG is measured with a pressure sensor, measuring the static pressure of the tail	☑

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Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
Pressure of stack gas (unit is not specified)	Pressure of stack gas (bar)	Pressure of stack gas (bar)	2.2, Table 2	gas, incorporated in the tail gas flow meter Calibration has been done together with the flow meter at QAL2/AST	IRL #0, #2
EF _{BL} Emissions factor for baseline period (tN ₂ O/tHNO ₃)	EF _{BL} Baseline emission factor (kg N ₂ O / ton 100% HNO ₃)	EF _{BL} Baseline emission factor (ton N ₂ O / ton 100% HNO ₃)	No, as this is calculated	While PDD states the unit as kgN ₂ O/tHNO ₃ to make it consistent to IPCC default, one in monitoring report is stated consistently to the applied methodology.	☑ IRL #0, #2
UNC Overall measurement uncertainty of the monitoring system (%)	UNC Overall uncertainty of the monitoring system (%)	UNC Overall uncertainty of the monitoring system (%)	No, as this is calculated	QAL2 reports state +/-3.89% for Sasolburg plant and +/- 4.14 for Secunda plant. AST report states that QAL2 results have been sufficiently maintained.	☑ IRL #0, #2, #6
EF _n Emissions factor calculated for nth campaign (tN ₂ O/tHNO ₃)	EF _n Emissions factor calculated for nth campaign (kgN ₂ O / ton100%HNO ₃)	EF _n Project emissions factor calculated for nth campaign (toneN ₂ O / tonne100%HNO ₃)	No, as this is calculated	Calculate in accordance with the applied methodology as well as the registered monitoring plan.	☑ IRL #0, #2
EF _{mn,a} Moving average emissions factor (tN ₂ O/tHNO ₃)	EF _{mn,a} moving average emissions factor calculated at the end of the <i>nth</i> pro-	EF _{mn,a} Moving average of emission factor calculated as the average of the	No, as this is calculated	In compliance	☑ IRL #0, #2

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Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
	ject campaign	emission factors of all previous project campaigns (toneN ₂ O / tonne100%HNO ₃)			
EF _{min} Minimum emissions factor after 10 campaigns (tN ₂ O/tHNO ₃)	EF _{min} Minimum emissions factor after 10 campaigns (tN ₂ O/tHNO ₃)	EF _{min} Minimum emissions factor after 10 campaigns (tN ₂ O/tHNO ₃)	No, as this is calculated	In compliance	☑ IRL #0, #2
EF _{reg} Emissions level set by incoming policies or regulations	EF _{reg} Local and national regulations on N ₂ O and NOX emissions (Kgs N ₂ O / ton HNO ₃)	EF _{reg} Local and national regulations on N ₂ O and NOX emissions (kg N ₂ O/ tonne HNO ₃)	N/A	No local or national regulation has been introduced during the project period	☑ IRL #0, #2
CL _n Campaign length (tHNO ₃)	CL _n Campaign length (Ton 100% HNO ₃)	CL _n Campaign length (tonne 100% HNO ₃)	No, as this is calculated	In compliance.	☑ IRL #0, #2
AFR Ammonia gas flow rate to the AOR (kgNH ₃ /h)	AFR Ammonia flow rate to the AOR (kgNH ₃ /hr)	AFR Ammonia flow rate to the AOR (kgNH ₃ /hr)	Stated at section 2.2, Table 4	Please see the table 4 in the next section 2.2	☑ IRL #0, #2
AIFR Ammonia to Air	AIFR Ammonia to air	AIFR Ammonia to air	Stated at section 2.2, Table 5	Please see the table 5 in the next section 2.2	☑

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Parameters					
Meth/tool	PDD	MR	Included in table	Compliance	Conclusion and IRL
ratio (m3/h) (& (%) in page 5)	flow rate to the AOR (Kg NH3/hour)	flow rate to the AOR (kg NH3/kg Air)			IRL #0, #2
OT _h Oxidation temperature for each hour (°C)	OT _h Oxidation temperature of the AOR (°C)	OT _h Oxidation temperature of the AOR (°C)	Stated at section 2.2, Table 6	Please see the table 6 in the next section 2.2	☑ IRL #0, #2
OP _h Oxidation Pressure for each hour (Pa)	OP _h Oxidation Pressure of the AOR (Bar)	OP _h Oxidation Pressure of the AOR (bar)	Stated at section 2.2, Table 7	Please see the table 7 in the next section 2.2	☑ IRL #0, #2
GS, Gauze supplier	GS, Gauze supplier	GS, Gauze supplier	Stated at section 2.4, Table 1	No change, Heraeus Please see the table 1 in the next section 2.4	☑ IRL #0, #2
GC Gauze composition	GC Gauze composition	GC Gauze composition	Stated at section 2.4, Table 1	No change Please see the table 1 in the next section 2.4	☑ IRL #0, #2

2.2. Parameters measured directly with instruments in the field

Table 1

Parameter and instrumentation Information					
	Meth/Tool	PDD	MR	Verification Findings	Conclusion

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					and IRL
Parameter title	N ₂ O concentra- tion in the stack gas	N ₂ O concentra- tion in the stack gas	N ₂ O concentration in the stack gas	In compliance	☑ IRL #0, #2
Parameter ID (if available)	NCSG	NCSG	NCSG	In compliance	
Data Unit	mgN ₂ O/m ³ (con- verted from ppm if necessary)	mgN ₂ O/m ³ (con- verted from ppm if necessary)	mgN ₂ O/m ³ (con- verted from ppm if necessary)		
Monitoring frequency (read- ing)	not referred	not referred	not referred	In compliance	
Monitoring frequency (re- cording)	Every 2 seconds	Every 2 seconds	Every 2 seconds	The recording frequency of every 2 seconds is verified with back-upped data on the display of monitoring PC during the site visit.	
Calibration requirements	The monitoring system is to be installed using the European Norm 14181 (2004). Regular calibra- tions according to vendor speci- fications and recognised in- dustry standards (EN14181).	Regular calibra- tions according to vendor specifica- tions and recog- nized industry standards	QAL2, QAL3, AST are referred	Calibration has sufficiently been done through QAL1, QAL2/AST and QAL3 to comply with EN14181	☑ IRL #0, #2, #6
Uncertainty level	Low	2.77% for Sasol- burg and 2.67% for Secunda were	+/-3.89% for Sasolburg plant and +/- 4.14 for	UNC, the total uncertainty has been determined correctly based on the result of QAL2 done by the accred-	☑ IRL #0, #2,

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		"estimated" as the overall uncertainty of AMS based on the specifications	Secunda plant as the overall uncertainties are referred in MR based on QAL2 done	ited laboratory, SGS Environmental Services	#6
Measurement Principle (if applicable)	N2O analyser	on-line analyzer (Non Dispersive Infra Red principle)	AMS (infrared gas analyzer)	In compliance	☒ IRL #0, #2, #6
	Technical aspects				
Instrument Type:	NCSG is measured with ABB AO2040 at both Sasolburg and Secunda plants.				☒ IRL #6
Serial Number:	24031-0-331004300000, 24031-0-331004300000				☒
Manufacturer Model Nr.:	ABB, model AO 2040				☒
Specific Location:	The analyzer is installed in the control panel separately. Tail gas is extracted from the the stack with a probe. The sample gas is transported through a Teflon tube to the analyzer via a pump.				☒
Measurement Range:	0-500 ppmv (0-925 (kgN ₂ O/m ³)) at Sasolburg, 0-2000 ppmv (0-3,700 (kgN ₂ O/m ³)) at Secunda				☒ IRL #6
Gaps in operating time of instrument :	Period : <u>Corrective Action Request #3.</u> There were periods at Secunda for which the credibility of NCSG values needed to be justified. A) Although "analyser faulty" was recorder for 1-6th Jan. 09 in the operation logbook, there is no applicable treatment done in the calibration spreadsheet. B) Moreover, there is no further information other than "analyser faulty" about one during 1-6th Jan. 09, i.e. no information about what kind of problems specifically happened, when & how & by whom they were fixed, what evidence is available to justify the end of the problems, what was the date about when the malfunctioning was likely to start happening, how the start				☒ IRL #7

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	date can be justified. In fact, NCSG indicate sudden rise from 29th December to 06th Jan. 09, not from 1st Jan. 09 as far as the verifier makes graphical analysis. As ERs calculation is made on hourly basis, please specify the hours of malfunctioning with objective evidences. And please revise the spreadsheet accordingly. C) There were missing Zero/Span checks frequently although the frequency is defined to be weekly internally by Sasol. As at least every 3 weeks was the recommendation of the manufacture, occasional missing is not likely to increase the risk. However there were long vacancies found in Shewhart chart, e.g. no Zero/Span checks after 25th Aug. 08 until 1st Dec.08 (for more than 3 months.), missing after 29th Dec. 08 until 20th Jan. 09 (In fact, NCSG values fluctuated during this period.) This means that QAL3 has not been appropriately maintained at all at Secunda, specially during the 3rd project campaign. And thus the verifier can not immediately accept the overall credibility of NCSG data without having sufficient justification particularly for long vacancies. Although AST report issued by SGS Environmental Service does not raise this problem, Sasol is expected to obtain expert's opinion about these vacancies D) By the way of clarifying the above issue with the accredited laboratory, please clarify the meaning of the 1st paragraph in the Remark of "Summary and conclusion" page, "During the 4th campaign the values in the Shewhart chart of Secunda are obtained from the sample gas this should be reference gas before calibration." Since this sentence could mean wrong procedures of Zero/Span checks taken at Secunda.	
	Default value used : No default value was applied.	-
	QA/QC aspects	Conclusion and IRL
Source of data	At Sasolbug, all CDM data are monitored continuously on the DeltaV Distributed Control System (DCS) by production personnel in the Control Room. The Instrument Engineer will be responsible for the AMS, data gathering and report generation. Primary data storage is done in a PI database, which form an integral part of the DCS system, at two second intervals. Data are stored in batches of about six days, with only the last five months data continuously available on the DCS. Scheduled backups of the last four batch files are made on a CD every 24 days and stored in a fireproof safe at the Ammonia plant. This data must be restored on the originating PI database	☒ IRL #2, #6, #12

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	before the data can be viewed or interrogated. With the completion of a campaign, data will be transferred from backup CD's to a DVD to minimize space requirements in the fireproof safe. Data are also stored at 30 second intervals in a secondary database which form part of the Sasol Local Area Network and can be viewed from any LAN point. This second database can also be used for reporting should there be a major failure of the primary database At Secunda, all CDM data are monitored continuously on the remote located PC (in the plant control room) via the SCADA INTOUCH and ACTIVE FACTORY software package by production personnel in the Control Room. The PC has access rights to the DAS server computer where the raw data from the instruments is written on a continuous basis. The Area Leader/Manager Maintenance - Engineer will be responsible for the AMS, data gathering and report generation. A daily summary report of hourly average data is generated by the DAS and a unique file is written to the common disk drive (analyzer Z:\) every morning at 05:00AM from where it can be viewed by selected personnel only, in this case the Monitoring Engineer and the Plant production Area leader. This file is safeguarded as read only and cannot be modified or changed as only the third party consultant who developed the DAS and AMS has the password to bypass the safeguarding and access the file for modification. All raw data written to the server hard disk drives, which are setup up using five identical hard disk drives in parallel service is available at any time and can be written to DVD format and forwarded to any party concerned.	
Archiving of raw data and protection measures	As mentioned above.	☒ IRL #2, #6
Data transfer and protection of input data for calculations	As mentioned above.	☒
	Quality of evidence	Conclusion and IRL
Completeness of data	All hourly data have been submitted in the calculation spreadsheet so that the verifier could review the integrity from various point of view, e.g. normality on the series data, graphical check, comparison to one from other sources.	☒ IRL #2, #10
Data verification	Consistency of calculation tool with monitoring report: Values of calculation tool and Monitoring Report has been reviewed after receiving the final versions.	☒

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Crosscheck (if available)	In order to ensure the integrity of the data, the verification team reviewed the series of hourly data in parallel with other parameters including to make a graph with the Excel file calculation sheet submitted.	☒ IRL #2
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Table 2

Parameter and instrumentation Information					
	Meth/Tool	PDD	MR	Verification Findings	Conclusion and IRL
Parameter title	Volume flow rate of the stack gas	Volume flow rate in the stack gas	Volume flow rate in the stack gas	In compliance	☒ IRL #0, #2
Parameter ID (if available)	VSG	VSG	VSG	In compliance	
Data Unit	m3/h	Nm3/h	Nm ³ /h (wet basis)	In compliance	
Monitoring frequency (reading)	not referred	not referred	not referred	In compliance	
Monitoring frequency (recording)	Every 2 seconds	Every 2 seconds	Every 2 seconds	The recording frequency of every 2 seconds is verified with back-upped data in CSV format saved and retained in CD-Rs during the site visit	
Calibration requirements	The monitoring system is to be installed using the European Norm 14181 (2004). Regular calibrations according to vendor specifications and	Regular calibrations according to vendor specifications and recognized industry standards (EN14181).	QAL2, QAL3, AST are referred	Calibration has sufficiently been done through QAL2 and AST to comply with EN14181	☒ IRL #0, #2, #6

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	recognised industry standards (EN14181).				
Uncertainty level	Low	2.77% for Sasolburg and 2.67% for Secunda were "estimated" as the overall uncertainty of AMS based on the specifications	+/-3.89% for Sasolburg plant and +/- 4.14 for Secunda plant as the overall uncertainties are referred in MR based on QAL2 done	UNC, the total uncertainty has been determined correctly based on the result of QAL2 done by the accredited laboratory, SGS Environmental Services.	☒ IRL #0, #2, #6
Measurement Principle (if applicable)	Gas volume flow meter	An Ultrasound principle device at Sasolburg. ANNUBAR device (multiple pressure differential principle) at Secunda	AMS (flow meter)	In compliance. Sick Maihak FLSE PMD20SSALA (Ultrasonic type) at Sasolburg and Rosemount Multipoint Annubar TAG at Secunda	☒ IRL #0, #2, #6
Technical aspects					
Instrument Type:	Ultrasonic type at Sasolburg and multiple pressure differential type at Secunda				☒ IRL #6
Serial Number:	05428742, 0135A				☒
Manufacturer Model Nr.:	Sick Maihak FLOWSIC100(FLSE PMD20SSALA), Rosemount Multipoint Annubar TAG <u>Corrective Action Request #4.</u> Please correct the typo in the monitoring report where "SICK FLOWSIC 100" is stated as the stack gas flowmeter at Secunda although it is Rosemount Annubar.				
Specific Location:	Probes on the vertical stack.				☒

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Measurement Range:	0-40m/s , 0-100m/s(0-135873m3/h)	☒ IRL #6
Gaps in operating time of instrument :	Period : No gap in operation was found in records including operation log and the measured data	
	Default value used : No default value was applied.	
	QA/QC aspects	Conclusion and IRL
Source of data	As stated in the same section for NCSG above, raw data is automatically stored in DCS/DAS	☒ IRL #0, #2, #6
Archiving of raw data and protection measures	As mentioned above all the measured data is archived on the PC. The data archived including every 2 seconds' data is periodically backed up in text files in CD-Rs/DVDs	☒
Data transfer and protection of input data for calculations	While there is physical access control to enter the monitoring room where PCs are installed, the personnel who may operate the PCs has been specified as his responsibility. In addition, the data backed up in CD-Rs/DVDs is not editable.	☒
	Quality of evidence	Conclusion and IRL
Completeness of data	All hourly data have been submitted in the calculation spreadsheet so that the verifier could re-view the integrity from various point of view, e.g. normality on the series data, graphical check, comparison to one from other sources.	☒ IRL #2, #10
Data verification	Consistency of calculation tool with monitoring report: Values of calculation tool and Monitoring Report has been reviewed after receiving the final versions.	☒
Crosscheck (if available)	In order to ensure the integrity of the data, the verification team reviewed the series of hourly data in parallel with other parameters including to make a graph with the Excel file calculation	

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	sheet submitted. For an instance, the shape of VSG graph looks similar to one of AFR, the ammonia supplied and there is no considerable abnormality found.	
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Table 3

Parameter and instrumentation Information					
	Meth/Tool	PDD	MR	Verification Findings	Conclusion and IRL
Parameter title	Nitric Acid production (100% concentrate)	Total nitric acid production	Total nitric acid production	In compliance	☑ IRL #1, #2, #3
Parameter ID (if available)	NAP	NAP	NAP	In compliance	
Data Unit	tHNO ₃	ton 100% HNO ₃	tonne 100% HNO ₃	In compliance	
Monitoring frequency (reading)	not referred	Measured daily	not referred	In compliance	
Monitoring frequency (recording)	Daily, compiled for entire campaign	Recorded daily	Daily	Daily data has been submitted in the excel file. (IRL #6)	
Calibration requirements	Included in evaluation by third party validator	Critical instruments are calibrated on a routinely basis according to the quality assurance system of the plant (ISO 9000).	Yearly (Sasolburg), "exchange and check instrument with every gauge change" (Secunda)	<u>Corrective Action Request #5.</u> At the previous verifications, the verifier agreed that no particular maintenance including calibration on the Coriolis type flowmeter was not required in accordance with the letter from the manufacture in which only appearance inspection is recommended. However the calibration frequency at Sasolburg is still stated "Yearly". And, contradictory, "Pre-	

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				vious calibration date" is stated as "Dec 2009" which is more than 1 and half year after "Last calibration date" Apr 2008. (Why is the span more than 1.5 years? Why the "last" is older than "previous"?) Please clarify with evidences about if "yearly" calibration is necessary at Sasolburg. And please submit a calibration record made "Apr 2009".	
Uncertainty level	Low	not referred	not referred	In accordance with the calibration certificate issued on Nov. 2007 by Micro Motion, the uncertainty in the specification is stated as $\pm 0,03\%$.	☒ IRL #12
Measurement Principle (if applicable)	Not specified as only "Production log" is referred as the source.	an accurate mass flow meter (Coriolis principle)	not referred	Coriolis type flowmeter is used at both plant.	☒ IRL #0, #2, #6
Technical aspects					
Instrument Type:	Coriolis type mass flow measurement				☒ IRL #0, #2, #6
Serial Number:	Sasolburg:3747530, 11035097(Transmitter)/12034695(Sensor), Secunda : C200BD20000				☒
Manufacturer Model Nr.:	Micromotion Rosemount RFT9739D4SU4, Endress Hauser Promass 83F				☒
Specific Location:	On the piping of nitric acid being transported from the absorption tower to the ammonium nitrate production process.				☒
Measurement Range:	0 - 34,540 kg/hr, 0 – 80 ton/h				☒

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Gaps in operating time of instrument :	There has been no gap in operation since this mass flow meter was successfully installed prior to the start of baseline campaign.	☒
	N/A	☒
	N/A	☒
	QA/QC aspects	Conclusion and IRL
Source of data	As stated in the same section for NCSG above, raw data is automatically stored in DCS/DAS	☒ IRL #6
Archiving of raw data and protection measures	As mentioned above all the measured data is archived on the PC. The data archived is periodically backed up in text files in CD-Rs/DVDs	☒ IRL #12,
Data transfer and protection of input data for calculations	While there is physical access control to enter the monitoring room where PCs are installed, the personnel who may operate the PCs has been specified as his responsibility. In addition, the data backed up in CD-Rs/DVDs is not editable.	☒ IRL #2, #10, #12
	Quality of evidence	Conclusion and IRL
Completeness of data	All applicable daily data has been submitted in the Excel file.	
Data verification	The graphical analysis has been done e.g. the comparison between ammonia supply and acid production, in addition to the consistency between calculation tool and monitoring report.	
Crosscheck (if available)	<u>Clarification Request #1.</u> Secunda has provided the daily cross-checking result between the mass-balance data and "meter reading" the data measured with the flowmeter in the list, in which the daily differences are indicated. 1. In the calculation spreadsheet, the daily production of nitric acid is stated to be 695.56 t100%HNO3 while the "CDM Mass Balance.xls" provides 1,169 as Meter Reading and 1,303.8 as Mass Balance data on 31 st August '08. And the check result is indicated as "ER-	☒ IRL #2, #10, #12

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	ROR". Please clarify how 695.56 has been chosen in this circumstances. 2. There are considerable number of ERRORS indicated in "CDM Mass Balance.xls" including 119.6% ERROR on 1st Jul. '09, 107.2% ERROR on 24th Jul. '09 and 107.6% ERROR on 31st Dec. '09. Please clarify how these 3 extreme values took place. Please explain how each ERROR are treated to determine daily NAP. 3. If most of ERROR are not real ERROR e.g. due to the timing difference of the determination of daily mass-balance, such frequent daily ERRORS' ON/OFF look very noisy to discuss the overall credibility of Meter Reading data. If possible, please provide the cross-checking results for longer spans, e.g. monthly comparison. Clarification Request #2. About Sasolburg, no cross-checking record about nitric acid produced has been provided in order to ensure the credibility of "Meter Reading" data.	
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Table 4

Parameter and instrumentation Information					
	Meth/Tool	PDD	MR	Verification Findings	Conclusion and IRL
Parameter title	Ammonia gas flow rate to the AOR	Ammonia flow rate to the AOR	Ammonia flow rate to the AOR	In compliance	☒ IRL #0, #2, #4, #6
Parameter ID (if available)	AFR	AFR	AFR	In compliance	
Data Unit	kgNH3/h	kgNH3/h	kgNH3/h	In compliance	
Monitoring frequency (reading)	not referred	at a given time interval	not referred	In compliance	
Monitoring frequency (recording)	Continuously	at a given time interval	Continuously	In compliance	
Calibration requirements	Included in evaluation by third	Critical instruments are cali-	Yearly	In compliance	☒

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	party validator	brated on a routinely basis according to the quality assurance system of the plant (ISO 9000).		This parameter is required to be monitored for baseline campaign only by AM0034 version 2.	IRL #0, #2, #6
Uncertainty level	Low	not referred	not referred	±0.025% in the specification	☑ IRL #6
Measurement Principle (if applicable)	Not specified	orifice plate principle	not referred	In compliance Actually orifice & differential pressure transmitter are used.	☑
	Technical aspects				
Instrument Type:	orifice and differential pressure transmitter				☑ IRL #0
Serial Number:	Sasolburg: 1526279 & 1526306 & 1458162 incl. spares, Secunda: 824567				☑
Manufacturer Model Nr.:	Rosemount 3051, Honeywell ST3000				☑
Specific Location:	On the piping of ammonia supply before NH3 & Air mixer				☑
Measurement Range:	0 – 1,800 Nm3/h				☑ IRL #6
Gaps in operating time of instrument :	There has been no gap in operation during the baseline campaign				☑
	N/A				☑
	N/A				☑
	QA/QC aspects				Conclusion and IRL

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Source of data	The measured data is transmitted from the analyser to DCS/DAC	☒ IRL #0, #2, #6
Archiving of raw data and protection measures	As mentioned above all the measured data is archived on the PC. The data archived is periodically backed up in text files in CD-Rs/DVDs	☒
Data transfer and protection of input data for calculations	While there is physical access control to enter the monitoring room where PCs are installed, the personnel who may operate the PCs has been specified as his responsibility. In addition, the data backed up in CD-Rs/DVDs is not editable.	☒
	Quality of evidence	Conclusion and IRL
Completeness of data	All applicable hourly data measured during baseline campaign has been submitted in the Excel file. (N/A for project campaigns)	☒ IRL #2
Data verification	Maximum ammonia gas flow rate to the AOR as the permitted operating range has been determined in accordance with the maximum load specified by the primary catalyst manufacture (IRL #19, letter from Heraeus dated on Oct and Nov 2006). And the comparison between the data measured during baseline campaign and the permitted operating range was correctly done. But, this parameter is not required to be monitored during project campaigns.	
Crosscheck (if available)	The graphical analysis has been done e.g. the comparison between ammonia supply and acid production, in addition to the consistency between calculation tool and monitoring report.	☒ IRL #2

Table 5

Parameter and instrumentation Information					
	Meth/Tool	PDD	MR	Verification Findings	Conclusion and IRL
Parameter title	Ammonia to Air ratio	Ammonia to air flow rate to the AOR	Ammonia to air flow rate to the AOR	In compliance	☒ IRL #0, #2,

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Parameter ID (if available)	AIFR	AIFR	AIFR	In compliance	#4, #6
Data Unit	m3/h, & % in page 5	Kg NH3/hour	Kg NH3/Kg Air	In compliance (since the parameter is the rate)	
Monitoring frequency (reading)	not referred	at a given time interval	not referred	In compliance	
Monitoring frequency (recording)	Continuously	at a given time interval	Continuously	In compliance (IRL #46)	
Calibration requirements	Included in evaluation by third party validator	not referred	Yearly	In compliance This parameter is required to be monitored for baseline campaign only by AM0034 version 2.	☑ IRL #0, #2, #6
Uncertainty level	Low	not referred	not referred	±0.025% in the specification	☑ IRL #6
Measurement Principle (if applicable)	Not specified	orifice plate principle	not referred	In compliance Actually orifice & differential pressure transmitter are used.	☑
Technical aspects					
Instrument Type:	orifice and differential pressure transmitter				☑ IRL #0
Serial Number:	Sasolburg: not identifiable, Secunda: 824567				☑
Manufacturer Model Nr.:	Rosemount 3051, Honeywell ST3000				☑
Specific Location:	On the piping of air supply before NH3 & Air mixer				☑
Measurement Range:	0-160,000 Nm3/hr				☑ IRL #6

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Gaps in operating time of instrument :	There has been no gap in operation	☒
	N/A	☒
	N/A	☒
	QA/QC aspects	Conclusion and IRL
Source of data	The measured data is transmitted from the analyser to DCS/DAC	☒ IRL #0, #2, #6
Archiving of raw data and protection measures	As mentioned above all the measured data is archived on the PC. The data archived is periodically backed up in text files in CD-Rs/DVDs	☒
Data transfer and protection of input data for calculations	While there is physical access control to enter the monitoring room where PCs are installed, the personnel who may operate the PCs has been specified as his responsibility. In addition, the data backed up in CD-Rs/DVDs is not editable.	☒
	Quality of evidence	Conclusion and IRL
Completeness of data	All applicable hourly data measured during baseline campaign has been submitted in the Excel file. (N/A for project campaigns)	☒ IRL #19
Data verification	Maximum ammonia to air ratio as the permitted operating range has been determined in accordance with the maximum load specified by the primary catalyst manufacture (IRL #19, letter from Heraeus dated on Oct and Nov 2006). And the comparison between the data measured during baseline campaign and the permitted operating range was correctly done. But, this parameter is not required to be monitored during project campaigns.	
Crosscheck (if available)	The graphical analysis has been done to check the consistency during the baseline campaign, in addition to the consistency between calculation tool and monitoring report.	☒ IRL #2

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Table 6

Parameter and instrumentation Information					
	Meth/Tool	PDD	MR	Verification Findings	Conclusion and IRL
Parameter title	Oxidation temperature for each hour	Oxidation temperature of the AOR	Oxidation temperature of the AOR	In compliance	☒ IRL #0, #2, #4, #6
Parameter ID (if available)	OT _h	OT	OT	In compliance	
Data Unit	°C	°C	°C	In compliance	
Monitoring frequency (reading)	not referred	at a given time interval	not referred	In compliance	
Monitoring frequency (recording)	Every hour	at a given time interval	Every hour	In compliance	
Calibration requirements	Not specified	not referred	Yearly	This parameter is required to be monitored for baseline campaign only by AM0034 version 2.	☒ IRL #0, #2, #6
Uncertainty level	Not specified	not referred	not referred	±1% in the specification.	☒ IRL #6
Measurement Principle (if applicable)	Not specified	thermo-couples	not referred	Thermo-couple type K is used	☒
	Technical aspects				
Instrument Type:	Thermo couples (K-type)				☒ IRL #0
Serial Number:	N/A				N/A

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Manufacturer Model Nr.:	Transducer is Endress Hauser iTEMP TMT 181 at Sasolburg and Honeywell ST3000 at Secunda	☒
Specific Location:	AOR	☒
Measurement Range:	0 – 1500 °C	☒ IRL #6
Gaps in operating time of instrument :	There has been no gap in operation	☒
	N/A	☒
	N/A	☒
	QA/QC aspects	Conclusion and IRL
Source of data	The measured data is transmitted from the analyser to DCS/DAC	☒ IRL #0, #2, #6
Archiving of raw data and protection measures	As mentioned above all the measured data is archived on the PC. The data archived is periodically backed up in text files in CD-Rs/DVDs	☒
Data transfer and protection of input data for calculations	While there is physical access control to enter the monitoring room where PCs are installed, the personnel who may operate the PCs has been specified as his responsibility. In addition, the data backed up in CD-Rs/DVDs is not editable.	☒
	Quality of evidence	Conclusion and IRL
Completeness of data	All applicable hourly data measured during baseline campaign has been submitted in the Excel file. (N/A for project campaigns)	☒ IRL #46
Data verification	As stated in the registered PDD, the permitted operating range has been determined based on the historic data at Sasolburg (IRL #19) and based on the specification of Uhde at Secunda (IRL #19). And the comparison between the data measured during baseline campaign and the permitted operating range was correctly done. But, this parameter is not required to be monitored	

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	during project campaigns.	
Crosscheck (if available)	The graphical analysis was done by the verification team to check if there was any abnormality appeared in the shape of the graph.	☒ IRL #2

Table 7

Parameter and instrumentation Information					
	Meth/Tool	PDD	MR	Verification Findings	Conclusion and IRL
Parameter title	Oxidation Pressure for each hour	Oxidation Pressure of the AOR	Oxidation Pressure of the AOR	In compliance	☒ IRL #1, #2, #3
Parameter ID (if available)	OP _h	OP _h	OP _h	In compliance	
Data Unit	Pa	Bar	bar	The difference of the unit has no impact on the emission reductions since operating conditions during baseline campaign was consistently compared to the permitted range.	
Monitoring frequency (reading)	not referred	Measured every hour	not referred	In compliance	
Monitoring frequency (recording)	Every hour	not referred	every hour	In compliance	
Calibration requirements	Not specified	Critical instruments are calibrated on a routinely basis according to the	Yearly	Punctually calibrated between campaigns (IRL #8)	☒ IRL #8

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		quality assurance system of the plant (ISO 9000).			
Uncertainty level	Not specified	not referred	not referred	±0.025% indicated in the specification..	IRL #21
Measurement Principle (if applicable)	Not specified	Not specified	Not specified	Pressure transducer is used	☒ IRL #1, #2, #3, #45
	Technical aspects				
Instrument Type:	pressure transducer				☒ IRL #0
Serial Number:	Sasolburg: 1526307, Secunda: 0423C2562941007001				☒
Manufacturer Model Nr.:	Rosemount Smart pressure transmitter model 3051 at Sasolburg and Honeywell ST3000 at Secunda				☒
Specific Location:	On the piping between NH3 air mixer and the ammonia oxidation reactor(AOR)				☒
Measurement Range:	0 – 800 psi (0 – 5.52MPa)				☒ IRL #6
Gaps in operating time of instrument :	There has been no gap in operation				☒
	N/A				☒
	N/A				☒
	QA/QC aspects				Conclusion and IRL
Source of data	The measured data is transmitted from the analyser to DCS/DAC				☒

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		IRL #0, #2, #6
Archiving of raw data and protection measures	As mentioned above all the measured data is archived on the PC. The data archived is periodically backed up in text files in CD-Rs/DVDs	☒
Data transfer and protection of input data for calculations	While there is physical access control to enter the monitoring room where PCs are installed, the personnel who may operate the PCs has been specified as his responsibility. In addition, the data backed up in CD-Rs/DVDs is not editable.	☒
	Quality of evidence	Conclusion and IRL
Completeness of data	All applicable hourly data measured during baseline campaign has been submitted in the Excel file. (N/A for project campaigns)	☒ IRL #46
Data verification	As stated in the registered PDD, the permitted operating range has been determined based on the specification of the plant (IRL #19). And the comparison between the data measured during baseline campaign and the permitted operating range was correctly done. But, this parameter is not required to be monitored during project campaigns.	
Crosscheck (if available)	The graphical analysis was done by the verification team to check if there was any abnormality appeared in the shape of the graph.	☒ IRL #2

2.3. Parameters measured through sampling

Not applicable as the project proponent does not determine the parameters with sampled measurement.

2.4. Parameters obtained through external sources and accounting data

Table 1

Parameter and instrumentation Information					
	Meth/Tool	PDD	MR	Verification Findings	Conclusion

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					and IRL
Parameter title	Gauze supplier Gauze composition	Gauze supplier Gauze composition	Gauze supplier Gauze composition	-	☒ IRL #0,#2
Parameter ID (if available)	GS, GC	GS, GC	GS, GC		
Data Unit	N/A	N/A	N/A	N/A	N/A
Monitoring frequency (reading)	Not specified	N/A	N/A	N/A	N/A
Monitoring frequency (recording)	Each campaign	Recording each campaign	Once for each campaign	In compliance	☒ IRL #0,#2
Calibration requirements	N/A	N/A	N/A	N/A	N/A
Uncertainty level	N/A	N/A	N/A	N/A	N/A
Measurement Principle (if applicable)	N/A	N/A	N/A	N/A	N/A
	Technical aspects				
Instrument Type:	N/A				N/A
Serial Number:	N/A				N/A
Manufacturer Model Nr.:	GS:W.C.Heraeus / GC: Sasolburg: Pt 54.0 to 56.0 %, Rh 3.6 to 3.9 %, Pd 40.0 to 42.0% and Secunda: Pt 54.0 to 55.0 %, Rh 3.5 to 3.8 %, Pd 41.0 to 43.0 %				☒
Specific Location:	AOR				☒
Gaps in operating time of instrument :	Period: N/A				N/A
	Default value used: N/A				N/A

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	Justification:N/A	N/A
	QA/QC aspects	Conclusion and IRL
Source of data	Report issued by Heraeus South Africa (IRL #16)	☒
Archiving of raw data and protection measures	Filed as purchasing records	☒
Data transfer and protection of input data for calculations	N/A	N/A
	Quality of evidence	Conclusion and IRL
Completeness of data	The consistency between historic campaign, baseline campaign and project campaign has been successfully verified.	☒ IRL #11
Data verification	Both Sasolburg and Secunda continue to use "FTCplus" supplied by W.C. Heraeus from historic campaigns. The gauze composition historically used have been confirmed with the letters named "Precious Metal Contents" sent from Heraeus in 2006.(IRL #16) And the continuation of using the same products have been verified with the purchasing documents issued by Heraeus SA (PTY) Ltd. every campaigns (IRL #16) in which the specification including the name of the products and the weight % of the platinum, Rhodium and Palladium are explicitly indicated. Clarification Request #3. Please provide an evidence about Gauze composition used for the 3 rd and the 4 th project campaigns since such evidence was not provided during the on-site visit. (For Sasolburg, a report from Heraeus South Africa, titled " Re: Fixed rate for 20th FTCPlus campaign " dated 16 th May 2010 has been submitted.)	
Crosscheck (if available)	N/A	N/A

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2.5. Other parameters not included in the methodology/tool but included in the PDD

N/A

3. Data Processing and ER calculation

Description of data processing from transferred data to final results in the calculation tool		
Step	Description	Conclusion and IRL
Consistency	All abbreviations and units consistent with the PDD and Methodology and traceable to the raw data	☒ IRL #0, #2
Calculation Tool description	The way of data processing and calculations are transparently provided and demonstrated comprehensively with the Excel files. The verification team has verified both hourly data and processed data from various point of view, consistency among a series of data, data processing/algorithm incorporated, default/maximum/minimum applied, the compliance to one described in Monitoring Plan as well as to AM0034. And there was neither immediate deficiency nor apparent inconsistency found in the data and the data processing, except the found like <u>Corrective Action Request #1</u> , <u>Corrective Action Request #3</u>	☒ IRL #0, #2
Elimination of not plausible data (if applicable)	Same as above.	<u>CAR #1</u>
Transformation from useable data to input data for further calculation (if applicable)	N/A	N/A
Ex-ante data	N/A	N/A

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Default parameter	➤ the conservative IPCC (4.5 kg N₂O/ton nitric acid) specified in the applied methodology ✓ In accordance with AM0034, this value shall be applied to the period of "AMS downtime" during baseline campaign in case, the last measured value is more than this default value ✓ As stated in the verification report for the 1st monitoring period, Sasol recognized considerable drift of N₂O concentration date measured for the 3 month period at the beginning of baseline campaign. And the reason was the vacancy of Span checks due to the availability of "Span gas". ✓ The applicable period were identified as "AMS downtime" and the more conservative value between IPCC default (4.5 kg N₂O/ton nitric acid) or the last measured value was correctly applied. ➤ During project campaign, the highest values (the most conservative values) measured during each entire project campaign were correctly applied for "AMS downtime" in accordance with the applied methodology.	☒ IRL #0, #2, #7
Formulae check	All formulae included in the calculation tool in compliance with the PDD and methodologies, AM0034. version 2	☒ IRL #0, #2
Rounding functions	Included rounding functions are correctly and conservatively applied.	☒
Calculation tool changes and protection measures	Calculations were done in the spreadsheet as well as in Monitoring Report and those documents were promptly submitted to the verifier to initiate a verification. Any changes on such tool or document were made traceable with the revision date and/or version.	☒
Reported data	As several parameters and calculation results are being corrected, the consistency between the final version of the calculation spreadsheet and the MR has been checked again prior to submitting a verification report.	☒

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4. Additional assessment

4.1. Internal Review

Description and performance of internal review		
	Description	Conclusion and IRL
Procedure	There was no specific internal audit for the monitoring activities	N/A
Documentation	N/A	N/A
Responsibilities	N/A	N/A

4.2. Peculiarities

Description of Peculiarities and unexpected Daily Events during the verification period		
	Description	Conclusion and IRL
Performance	<u>Corrective Action Request #6.</u> In the spreadsheets of the 3 rd and 4 th project campaigns at Sasolburg, following abnormalities are found 1) There are sudden negative values of N2O concentration, e.g. 30 April '08, 01 May '08, 06 May '08, 06 Jan '09. And few of them are included in the calculation while negative values should be treated as apparent abnormality. Please investigate reasons why this could happen, in order to identify the period of the abnormality. And please apply "AMS downtime" for the periods identified as abnormal. 2) Please clarify if -111.4 ppmv as the deviation found at Span check done on 1 Jun 2009 and 198.0 ppmv on 20 Feb '09 are within the control limit or not. If not, please apply the way of correction instructed by QAL2/AST provider SGS.	☒
Documentation	See above	☒
Measures	There has been no immediate measure initiated to stabilize the performance of the facility however the	☒

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	operation is gradually being improved.	
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4.3. Further additional requirements

Description of additional requirements to be checked		
	Description	Conclusion and IRL
N/A		N/A

4.4. Data Reporting

Description of the Monitoring Report		
	Comments and Results	Conclusion and IRL
Compliance with UNFCCC regulations	The published Monitoring Report was assessed based on the registered PDD and the applied methodology. The verification period is correctly stated in the Monitoring Report. <u>Corrective Action Request #7.</u> Please provide the same level of information required in the new monitoring report template publicized at EB54 http://cdm.unfccc.int/Reference/PDDs_Forms/Issuance/iss_form05_v01.doc , e.g. "Location of the project activity" including GPS coordinates of both plants, the same level of information on "Data and parameters monitored", "Comparison of actual emission reductions with estimates in the CDM-PDD" and "Remarks on difference from estimated value in the PDD"(if increased)	<u>Corrective Action Request #1</u>
Completeness and Transparency	The assessment verified the completeness and transparency of the data and the information presented in the monitoring report. Following findings were found in the published Monitoring Report.	☒
Correctness	Values from the assessed calculation tool and other relevant sources were correctly transferred to the final Monitoring Report.	☒

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5. Compilation and Resolutions of CARs, CRs and FARs

Corrective Action Requests by audit team		
	Comments and Results	Conclusion and IRL
Issue	<u>Corrective Action Request #1.</u> 1) About one for Secunda, 1-A)OH determination is explained to be made based on the daily operation log considering the operation of ammonia supply to the reactor. Then, please submit the applicable daily operation logs specially for days when the measured data were missing in the calculation spreadsheets, e.g. 19th Nov. '08, 22nd Dec.'08, 11th Jan. '09, 16th Jan. '09, 18th Jan. '09, 06-07th Feb. '09, 17th Mar. '09, 31st Mar. '09, 6th Apr. '09, 09th Apr. '09, 25th Apr. '09 for the 3rd project campaign and 06th May '09, 27-28th Jun. '09, 09-10th Aug. '09, 20th Sep. '09, 06th Jan. '10 for the 4th project campaign. 2) For Sasolburg 1-A)In general, the data including NCSG are much more stable at Sasolburg and Shewhart chart looks sound compared to the defective QAL3 implementation at Secunda. On the other hand, ways how OH has been determined would be clarified. Because, while the monitoring report provides "Annex 4 – Relevant event summary Sasolburg plant", in which shutdowns of the plants due to various specific reasons are reported, there are inconsistencies found particularly about OH among "NOx logbook", "AMS logbook" and the calculation spreadsheet. ① Please clarify the reasons why Sasolburg maintains and provides 2 sources, i.e. "NOx logbook" and "AMS logbook". Because values of "Lost time" are frequently different between these 2 sources about each event. And thus it looks confusing. As far as the verifier analyze the information as attached "Events&OH_3rd_Sasolburg.xls", OH values in the calculation spreadsheet which have been used to determine emission reductions are the most conservative, e.g. at least 17.77 hrs. more conservative than either one in "NOx logbook" or "AMS logbook" in total for the entire 3rd project campaign. And therefore daily inconsistency about each events in 2 logbook do not need to be considered a problem as long as OH determination has been made consistently to the source used, i.e. daily operation log considering the operation of ammonia supply.	☑ IRL#1, 5, 12, 13, 15

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Corrective Action Requests by audit team		
	Then, please provide daily operation logs which are applicable to the days of events.	
Response	[Further Request] Please provide response. Secunda: 1-A) The requested log sheets can be found in documents: 0862_001.pdf and 2444_001.pdf, that were submitted to the auditor. On February 6, 2009 and January 6, 2010 the plant was off line but no operating log was generated. The evidences can be found in documents: "1687_001.tif" and "Dagverslag0910.xls" Sasolburg: The "Nox logbook" is maintained by production personnel. This document indicates the downtime for the Nitric acid plant (HNO₃) and downtime for the Ammonium nitrate plant (ANS). The two plants are separated for Sasolburg internal statistics. Please notice at the headings that it says ANS and not AMS. By mistake in Annex 4 of the first version of the Monitoring Report it was copied the "ANS logbook" stating "AMS logbook". The ANS logbook was deleted in the latest version of the Monitoring Report since it does not apply to the project, and only "Nox logbook" corresponding to HNO₃ plant was left in the document.	
Assessment	"AMS logbook" was correctly "ANS logbook" issued at the next process and was found to be not applicable to the nitric acid plants. They were written in MR just by mistake. B.1. section of MR has been revised to present the tables of events in accordance with Operation Logbook. The consistency between OH determined and operation logs submitted has successfully been verified.	
Issue	<u>Corrective Action Request #2.</u> Please delete "(wet basis)" stated in the Monitoring Report as this can be confusing to explain what is done in the emission reduction calculation while the measurement itself is done on wet basis. As AST report clearly states, the adjustment factor as the result of QAL2/AST was determined assuming 2%	☒ IRL#1, 6, 9

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	moisture in the stack gas conservatively in order to provide the measured VSG values on dry basis, as the final outcome. Although immediate measurement is done on wet basis, all measured values are correctly converted to values conservatively on dry basis and then they are applied in the emission reduction calculation.	
Response	The requested modification was included in the latest version of the Monitoring Report.	
Assessment	Corrected. In accordance with AST report issued by SGS Environmental Service, the sample gas is fed to the N2O analyzer via "Flue gas treatment filters, cooler" and thus NCSG is measured on dry basis. And the correction factor of the tail gas volume flow measurement determined in the QAL2 report has correctly been applied to all the raw data conservatively to have the tail gas volume flow data on dry basis. Therefore the measurement is done consistently on dry basis at both Secunda and Sasolburg plants.	
Issue	<u>Corrective Action Request #3.</u> There were periods at Secunda for which the credibility of NCSG values needed to be justified. A) Although "analyser faulty" was recorder for 1-6th Jan. 09 in the operation logbook, there is no applicable treatment done in the calibration spreadsheet. B) Moreover, there is no further information other than "analyser faulty" about one during 1-6th Jan. 09, i.e. no information about what kind of problems specifically happened, when & how & by whom they were fixed, what evidence is available to justify the end of the problems, what was the date about when the malfunctioning was likely to start happening, how the start date can be justified. In fact, NCSG indicate sudden rise from 29th December to 06th Jan. 09, not from 1st Jan. 09 as far as the verifier makes graphical analysis. As ERs calculation is made on hourly basis, please specify the hours of malfunctioning with objective evidences. And please revise the spreadsheet accordingly. C) There were missing Zero/Span checks frequently although the frequency is defined to be weekly internally by Sasol. As at least every 3 weeks was the recommendation of the manufacture, occasional missing is not likely to increase the risk. However there were long vacancies found in Shewhart chart, e.g. no Zero/Span checks after 25th Aug. 08 until 1st Dec.08 (for more than 3 months.), missing after 29th Dec. 08 until 20th Jan. 09 (In fact, NCSG values fluctuated during this period.) This means that QAL3 has not been appropriately maintained at all at Secunda, specially	☒ IRL#8, 9, 14

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	during the 3rd project campaign. And thus the verifier can not immediately accept the overall credibility of NCSG data without having sufficient justification particularly for long vacancies. Although AST report issued by SGS Environmental Service does not raise this problem, Sasol is expected to obtain expert's opinion about these vacancies By the way of clarifying the above issue with the accredited laboratory, please clarify the meaning of the 1st paragraph in the Remark of "Summary and conclusion" page, "During the 4th campaign the values in the Shewhart chart of Secunda are obtained from the sample gas this should be reference gas before calibration." Since this sentence could mean wrong procedures of Zero/Span checks taken at Secunda.	
Response	A) For those days the analyzer was revised by ABB. They re set calibration and recalibrated it (work certificate 25132). A copy of the certificate was given to the auditor. The latest version of the calculation spreadsheet was corrected taking into account that event. B) Malfunctioning started on 24/12/08. ABB was call out on 24/12/08, they checked the sample cell and did the calibration (day work certificate 15133). Since the problems started again on December 30, ABB went again on 6/01/09 as it was mentioned above. C) Regarding the periods without checks, SGS opinion is that it is better not to delay the checks for so long but they also explained that since after that long period without checks, the frequency was improved, they though the accuracy of the analyzer was not compromised. . For those periods without checks the calculation spreadsheet were modified using the conservative criteria given by the following document: "Guideline for assessing compliance with the calibration frequency requirements (EB52)". [Further Request] ✓ Please submit a revised calculation spreadsheet in which the way of treating data including the values of error found at the delayed calibration is identified in the transparent way. The spreadsheet "Secunda Third Project Campaign ver 3.0.xls" includes a sheet called "Special considerations" in which the maximum permissible error and errors observed at the day of the delayed calibration were calculated. The maximum value between the maximum permissible error and the error observed at the day of the delayed check was applied to the long periods without checks.	

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	Those values are applied in column T of the sheet "Secunda Hourly average" and are coloured with different colours. The references are in column AB of the same sheet. Deviations observed at the days of the delayed calibrations can be found in the Shewhart Charts. ✓ Please submit a copy of SGS's opinion. And please further clarify what "since after that long period without checks, the frequency was improved, they though the accuracy of the analyzer was not compromised." means. (Does SGS affirm the validity of the data measured during the long absence of Zero/Span check? Or, are they saying, the conservative application of the guideline (Annex 60, EB52) can work on the data measured during the long absence of Zero/Span check? Or, are they saying, SGS can not assure the validity of the data measured during the long absence of Zero/Span check at all? SGS opinion is on document: "Re: SASOL- QAL3 at Secunda plant- Message (HTML)" ✓ Please clarify what kind of treatment has been done for the applicable data which can be affected by the malfunctioning on the N₂O analyzer happened in Dec. 08 to Jan. 09. Because this issue is another issue to the vacancy of Zero/Span checks. For the period from December 30, 2008 to January 6, 2009 the maximum N₂O value measured during the campaign was applied. Please, note that column S of the sheet "Secunda Hourly average" contains the N₂O analyzer status and for the mentioned period the status was set as "down". Accordingly, in column V of the same sheet, the hourly N₂O values were replaced by the maximum N₂O value, which was calculated in cell U8.	
Assessment	The periods where the credibility of measured data of N₂O concentration was not reasonably justifiable have been identified based on the maintenance logs and ABB's report.(IRL#12) And AMS downtime has correctly been applied to those periods. For the period where Zer/Span check was considered overdue, the conservative treatment has been applied based on the opinion of QAL2/AST provider, SGS Environmental Service (IRL#12) which is consistent to Guidelines for assessing compliance with the Calibration Frequency Requirements, version 01 (Annex 60, EB52). With regard to the sentence, "During the 4th campaign the values in the Shewhart chart of Secunda are obtained from the sample gas this should be reference gas before calibration.", the verifier did not	

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	find any wrong procedure or data. And the QAL3 data is considered sound as data recorded can be considered nothing but the measured data of reference gases.	
Issue	<u>Corrective Action Request #4.</u> Please correct the typo in the monitoring report where "SICK FLOWSIC 100" is stated as the stack gas flowmeter at Secunda although it is Rosemount Annubar.	☒ IRL#1, 7
Response	The requested modification was included in the latest version of the Monitoring Report.	
Assessment	The typo has been corrected in MR.	
Issue	<u>Corrective Action Request #5.</u> At the previous verifications, the verifier agreed that no particular maintenance including calibration on the Coriolis type flowmeter was not required in accordance with the letter from the manufacture in which only appearance inspection is recommended. However the calibration frequency at Sasolburg is still stated "Yearly". And, contradictory, "Previous calibration date" is stated as "Dec 2009" which is more than 1 and half year after "Last calibration date" Apr 2008. (Why is the span more than 1.5 years? Why the "last" is older than "previous"?) Please clarify with evidences about if "yearly" calibration is necessary at Sasolburg. And please submit a calibration record made "Apr 2009".	☒ IRL#9
Response	Currently Sasolburg plant verifies these instruments every 8 months, during Gauze changes. The reason for not performing a calibration during April 2009 was because the transmitter had failed before April 2009 and a new one was installed, so the plant skipped a period to come in line with the Gauze change again. Calibrations were done on: 11/04/2008, 23/10/2009 & 04/05/2010. <u>[Further Request]</u> Please clarify if "Calibrations were done on: 11/04/2008, 23/10/2009 & 04/05/2010" meant what can be called "calibration" or "appearance check" recommended by Endress Hauser. So far, the verifier did not receive applicable calibration records of nitric acid flowmeter installed at Sasolburg. (The current records are not informative, i.e. there is no specific information stated, e.g. tolerance/criteria used, val-	

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	ues of deviation observed, if adjusted or not as a result. And to calibrate the Coriolis type flowmeter, a special facility which can provide very stable liquid flow on the long straight piping would be necessary.) In case they are appearance check only, please do not call them calibration either in Monitoring Report or in this protocol. To be called calibration, at least Zero check and Span check at appropriate range shall be done and be recorded. The Coriolis transmitter is sent to the supplier, in this case, Alpret. They have a certified right to verify the accuracy of the transmitter and sensor. They perform these verifications and give Sasolburg a certificate indicating what values were measured prior the calibration (on the equipment arrival) and after calibration (in case it was necessary). If the test falls within the Specification which is 0.1%, no calibration is required. Alpret performs an appearance check and a calibration accuracy check. Certificates of the calibrations performed on the abovementioned days were forward to the auditor on the document "Calibration certificates.pdf"	
Assessment	Letter from the supplier Endress Hauser affirms no special maintenance such as calibration required for Coriolis type flowmeters (nitric acid) but recommends only appearance inspection. Sasolburg still calibrate transmitters which is a part of Coriolis type flowmeters. Although "Yearly" does not mean annual full-calibration, i.e. not entire function of flowmeter, this is still more than the recommendation of the supplier and complies with the statement in PDD "Critical instruments are calibrated on a routinely basis according to the quality assurance system of the plant (ISO 9001)." In fact, transmitter failed before April 2009 and was replaced from previous one (Serial NO. 3747530 in the calibration record on 11/04/2008) to the current one (Serial NO.11035097 in the calibration record on 23/10/2009)). This was the reason why there was the 1.5 years vacancy of calibration between 2008 and 2009. The verifier has accepted this as a new equipment is assured for the initial performance with the inspection at manufacture as the common industrial practice.	

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Issue	<u>Corrective Action Request #6.</u> In the spreadsheets of the 3rd and 4th project campaigns at Sasolburg, following abnormalities are found 1) There are sudden negative values of N₂O concentration, e.g. 30 April '08, 01 May '08, 06 May '08, 06 Jan '09. And few of them are included in the calculation while negative values should be treated as apparent abnormality. Please investigate reasons why this could happen, in order to identify the period of the abnormality. And please apply "AMS downtime" for the periods identified as abnormal. 2) Please clarify if -111.4 ppmv as the deviation found at Span check done on 1 Jun 2009 and 198.0 ppmv on 20 Feb '09 are within the control limit or not. If not, please apply the way of correction instructed by QAL2/AST provider SGS.	☒ IRL#8, 14
Response	1) The formula contained in column AL of sheet "Hourly Average" of file "Sasolburg Fourth project campaign- ver 2.1.xls" was modified in order to set the status of the analyzer as down when negative values were reported. The reasons for obtaining negative readings on the abovementioned days were: • Jan 06 '09 : Plant load was increased to full load after running on low load for 3 days and the analyzer department was working on preparing the analyzer for plant load increase. • May 05 '09: Plant load was increased to full capacity after running on min. load for 29 days due to the transportation strike and the analyzer department was working on preparing the analyzer for plant load increase. The formula contained in column AE of sheet "Hourly average" of file "Sasolburg Third project campaign (10 Aug 08 to 7 Dec 08)- ver 2.1.xls" was modified in order to set the AMS status as "AMS down" when negative values of N₂O were reported. The reasons for obtaining negative readings on the abovementioned days were: • April 30 '08: Plant tripped due to compressor train vibrations. It took a bit of time to purge the	

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	line and get the correct readings. - May 01 '08: Plant outage due to compressor train vibrations. It took a bit of time to purge the line and get the correct readings. - May 06 '08: The plant load was increased from low load to max load, and the analyzer department was working on preparing the analyzer for plant load increase. 2) The values observed during the QAL3 on Feb 20 '09 and Jun 01 '09 were out of control limits. The proper correction was applied on the sheet "Hourly average" of file "Sasolburg Fourth project campaign- ver 2.1.xls"	
Assessment	As stated in the above response, all negative values observed in the third project campaign at Sasolburg have been considered abnormal and the highest value in the entire project campaign has conservatively been applied to all applicable hours as AMS downtime. The reason why negative values are suddenly appear and disappear were mostly due to maintenance while S_{AMS} (standard deviation defined in EN14181) for zero point determined by ABB is 20.96mg/m³, drifting 2 sigma i.e. -41.92 mg/m³ (-21.3ppmv) or occasional drift within 3 sigma can still happen statistically as QAL3 is maintained with 2 sigma in accordance with EN14181. (That is probably why UNC is considered in CERs calculation in accordance with AM0034.) And where significant deviations were found at Zero or Span checks (if exceeds the control limit +/- 2 S_{AMS} defined in EN14181, values measured for the last span of Zero/Span check have been corrected in accordance with SGS, QAL2/AST provider. What were done are identified in "Special consideration" sheet in the calculation spreadsheet of Sasolburg 4th project campaign.	
Issue	<u>Corrective Action Request #7.</u> Please provide the same level of information required in the new monitoring report template publicized at EB54 http://cdm.unfccc.int/Reference/PDDs_Forms/Issuance/iss_form05_v01.doc , e.g. "Location of the project activity" including GPS coordinates of both plants, the same level of information on "Data and parameters monitored", "Comparison of actual emission reductions with estimates in the CDM-PDD" and "Remarks on difference from estimated value in the PDD"(if increased)	☒ IRL#1

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Project Title: "Sasol Nitrous Oxide Abatement Project" – (0961)

Date of Completion: 17/01/2012

Number of Pages: 53 / 55



Industrie Service

Corrective Action Requests by audit team		
Response	Version 3.0 of MR is written in the Monitoring Report Template provided by the EB.	
Assessment	The form has correctly been updated.	
Issue	<u>Clarification Request #1.</u> Secunda has provided the daily cross-checking result between the mass-balance data and “meter reading” the data measured with the flowmeter in the list, in which the daily differences are indicated. 1. In the calculation spreadsheet, the daily production of nitric acid is stated to be 695.56 t100%HNO3 while the “CDM Mass Balance.xls” provides 1,169 as Meter Reading and 1,303.8 as Mass Balance data on 31st August '08. And the check result is indicated as “ERROR”. Please clarify how 695.56 has been chosen in this circumstances. 2. There are considerable number of ERRORS indicated in “CDM Mass Balance.xls” including 119.6% ERROR on 1st Jul. '09, 107.2% ERROR on 24th Jul. '09 and 107.6% ERROR on 31st Dec. '09. Please clarify how these 3 extreme values took place. Please explain how each ERROR are treated to determine daily NAP. 3. If most of ERROR are not real ERROR e.g. due to the timing difference of the determination of daily mass-balance, such frequent daily ERRORS' ON/OFF look very noisy to discuss the overall credibility of Meter Reading data. If possible, please provide the cross-checking results for longer spans, e.g. monthly comparison.	☑ IRL#15
Response	1- The figure 1169 ton is the mass of the produced nitric acid, expressed as diluted acid. The acid strength for that day was 59.5%. Those numbers gave the value of 695.56 ton of 100% HNO₃. 2- For 1st July'09 – Daily production reports are generated automatically and for this day there was a problem with the printer and there was no printout to show the amount of acid produced. Therefore, people responsible for developing the Mass Balance used the production figure corresponding to 30th June 2009, in order to perform the calculation. That was the reason of the big difference observed. For 24th July 09 and 31st December 09 there were no records of the amount of acid used at AN plant and hence the Mass Balance contains empty cells in column C.	

Verification Protocol

Project Title: "Sasol Nitrous Oxide Abatement Project" – (0961)

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Industrie Service

Corrective Action Requests by audit team		
	3- CDM mass balance on monthly basis was sent to the auditor after the site visit. CDM mass balance on monthly basis can be found in the following document: "Secunda- monthly CDM Mass Balance1.xls".	
Assessment	Clarified. The verifier confirmed no extreme difference in the cross-checking result and has been given consistent reasons about above cases. As the short term variation of daily mass-balance can happen commonly in this industry, the similarity of the cross-checking data for longer term is important. Monthly cross-checking data of which the average was 3.6% and the biggest monthly difference 9.2% has been considered reasonable as the balance data is determined with the tank level, amount fed to Ammonia Nitrate, amount dispatched for which we can not technically expect very precise measurement.	
Issue	<u>Clarification Request #2.</u> About Sasolburg, no cross-checking record about nitric acid produced has been provided in order to ensure the credibility of "Meter Reading" data.	☒ IRL#15
Response	The weekly Nox reports report the Cross checking of the nitric acid meter. Those reports were provided to the auditor during the site visit. Please, see columns F (actual production) and G (mass balance) of the sheet "Daily averages" of "NOXWeek Report".	
Assessment	All NOXWeek Reports were submitted for the entire monitoring period as the successful evidence about cross-checking of the amount of nitric acid produced. No abnormality is found in any data for days of normal operation.	
Issue	<u>Clarification Request #1.</u> Please provide an evidence about Gauze composition used for the 3 rd and the 4 th project campaigns since such evidence was not provided during the on-site visit. (For Sasolburg, a report from Heraeus South Africa, titled " Re: Fixed rate for 20th FTCPlus campaign " dated 16 th May 2010 has been submitted.)	☒ IRL#16
Response	The evidence from gauze composition used at Secunda plant was submitted to the auditor.	

Verification Protocol

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Date of Completion: 17/01/2012

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Corrective Action Requests by audit team		
Assessment	The report for both 15 th and 16 th campaign for the 3 rd and the 4 th project campaigns has been submitted to demonstrate no change on the gauze composition as well as the supplier of the primary catalyst at Secunda plant.	

PERIODIC VERIFICATION

“Point of Use Abatement Device to Reduce SF₆ emissions in LCD Manufacturing Operations in the Republic of Korea (South Korea)” (3440)



Industrie Service

Annex 2: Information Reference List

Final Report	17-01-2012	Verification of the CDM Project: 3rd Periodic Verification of "Sasol Nitrous Oxide Abatement Project", South Africa (unfccc ref-0961) Information Reference List	Page 1 of 12	 Industrie Service
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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
1	MGM / Sasol	<u>Monitoring Report, Project Design Documents, Previous Verification Reports</u> - Monitoring Report, Version 01, 25 March 2010 (GSP Version) - Monitoring Report, Version 02, 13 October 2010, revised to comply with the findings - Monitoring Report, Version 3.0, 28 January 2011 - Monitoring Report, Version 4.0, 24/08/2011 (Final version) - Monitoring Report, Version 5.0, 04/01/2012 (Final version after Incompleteness) - PDD (registered), "Sasol Nitrous Oxide Abatement Project", South Africa, version 5, dated 31/01/2007 http://cdm.unfccc.int/Projects/DB/DNV-CUK1171877538.97/view - Verification Report issued at the last verification (2nd PV, CERs have been issued) dated 16/03/2010	Various See the left column.	none
2	UNFCCC	<u>References and requirements at UNFCCC</u> - Approved baseline and monitoring methodology AM0034: Catalytic reduction of N2O inside the ammonia burner of nitric acid plants, version 02 (EB27) applied to PDD http://cdm.unfccc.int/methodologies/DB/X3KHFURC8891R7AFJZ4DEKTT0W2EF4/view.html - Clarification to AM0034 (version 02):Catalytic reduction of N2O inside the ammonia burner of nitric acid plant, Annx 12 of EB51 report , clarifying the ways of recalculation of baseline emissions in relation to the campaign length http://cdm.unfccc.int/EB/051/eb51_repan12.pdf - Guidelines for completing the monitoring report form, version 01 (Annex 34, EB54) http://cdm.unfccc.int/Reference/Guidclarif/iss/iss_guid06_v01.pdf - Guidelines of completeness check of requests for issuance, version 01,(Annex 68, EB48)	Various See the left column.	

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		report http://cdm.unfccc.int/EB/048/eb48_repan68.pdf - Guidelines for assessing compliance with the Calibration Frequency Requirements, version 01 (Annex 60, EB52) http://cdm.unfccc.int/EB/052/eb52_repan60.pdf - Tool to determine the mass flow of a greenhouse gas in a gaseous stream, version 01 (Annex 10, EB47) http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v1.pdf/history_view - CDM Glossary version 05 (EB47) http://cdm.unfccc.int/Reference/glossary.html - CDM Validation and Verification Manual, version 01.2(EB55) http://cdm.unfccc.int/Reference/Manuals/index.html		
3	n/a	<u>Audit participants</u> On-site and on-line interviews conducted on 11-13 May 2010 by TÜV SÜD Verification team: Mr Yutaka Yoshida GHG Auditor TÜV SÜD, Japan Interviewed persons: Mr.PN Venter Quality Manager Sasol Nitro, Secunda South Africa Ms. Melissa Scholtz (Brand) CDM Practitioner Sasol Nitro, Secunda South Africa Mr. Steve Evenwell Production Manager Sasol Nitro, Secunda, South Africa Mrs María Inés Hidalgo Chemical Team Director, MGM, Argentina Mr Daniel M. Molepo Process Engineer Sasol Nitro, Secunda South Africa	n/a	

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		Mr TM Mthembu Laboratory Manager Sasol Nitro, Secunda South Africa Mr H. Marx Maintenance Sasol Nitro, Sasolburg South Africa Mr. JMJ. Pieters Instrument Control Sasol Nitro, Sasolburg South Africa Mr. CA. Cronje Production Sasol Nitro, Sasolburg, South Africa Mr. Fred van Heerden Instruments Sasol Nitro, Sasolburg, South Africa Mr. Siphwe Mthembu Production Sasol Nitro, Sasolburg, South Africa		
4	n/a	<u>Changes, e.g. Request for Deviation, Revision or Clarifications</u> - N/A, no deviation was found	n/a	
5	Sasol	<u>Project Implementation</u> - "NOX WEEKLY REPORT" in Sasolburg as daily reports in which HNO3 production, N2O amount and the other operational parameters are reported, from Dec. 2007 to April 2010 - "NA-Plant NOx-CAMP01SEC-CATrev05-MIH (2).xls" in Secunda as daily reports in which HNO3 production, N2O amount and the other operational parameters are reported, from 29/08/2006 to 17/03/2010	Various See the left column.	
6	Sasol, SGS	<u>Monitoring Structure, QA/QC</u> - Algorithm of normalizing stack gas flow data with temperature and pressure data incorporated in DCS at Sasolburg - Screen shot indicating schematic diagram of the Sasolburg plant - Conversion Chart Weight/Concentration of HNO3 being used for the analysis at Sasolburg	Various See the left column.	

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		- Example of every 2 seconds data of N2O data recorded on as of the days of the on-site visit - sAMS calculation for Secunda to determine UCL/LCL of Shewhart chart		
7	Sasol, suppliers	<u>Monitoring Equipment</u> - "Critical instrumentation equipment – CDM Project Activities list", SECCDM-0010 at Secunda as a part of QMS documents - List of instruments SSBCDM0014 at Sasolburg, as a part of QMS documents - Product Data Sheet Rosemount3095 Mass Flow Meter for nitric acid produced - Product Data Sheet for the pressure transmitter installed on the stack gas flowmeter, explaining "real-time fully compensated with temperature and pressure data." - Sasolburg, Mass ProBar Configuration Certification as a certificate for Air Flow Meter and NH3 Flow Meter, issued by NIC Instruments & Engineering, dated 01 April 2006	Various See the left column.	
8	Sasol	<u>Calibration</u> - Shewhart Chart and Zero/Span check results of N2O analyzer operated at Sasolburg plant, i.e. QAL3 result from 01/01/2008 to 30/12/2008 - Shewhart Chart and Zero/Span check results of N2O analyzer operated at Sasolburg plant, i.e. QAL3 result from 07/01/2009 to 28/12/2009 - Hand writing Zero/Span check records on ABB Uras 14, 302-AI-401A-E, N2O analyzer in Sasolburg, 29/09/07 – 09/07/08 - "Shewart Nitro Stats 18-08-09 Sasolburg.xls", Shewhart Chart and Zero/Span check results of all gas components, e.g. NOx, O2, NH3, N2O at Sasolburg plant from 2006 to 2009	Various See the left column.	

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		- "Shewart Nitro Stats 2008 Sasolburg.xls", Shewhart Chart and Zero/Span check results of all gas components, e.g. NOx, O2, NH3, N2O at Sasolburg plant from 2006 to 2008 - "Shewharts 3de Campaign SPAN & ZERO.xls" maintained at Secunda - "Shewharts 4th Campaign SPAN ZERO.xls" maintained at Secunda - Raw records of Zero/Spn checkon N2O analyzer, named "Analyzer test certificate" at Secunda, dated 16/03, 13/07, 20/07, 03/08, 17/08, 31/07, 08/09, 24/08, 31/08, 14/09, 18/09, 22/09, 29/09, 02/10, 05/10, 20/10, 26/10, 12/10, 03/11, 10/11, 17/11, 24/11, 01/12, 09/12, 16/12, 23/12 in 2009 and 04/01, 10/01, 18/01, 27/01, 08/02, 02/03, 15/02, 24/02, 08/03, 18/03		
9	SGS, Alpret, Endress Hauser, Vaal-Tech Instrumentation	<u>External Calibration</u> - AST Report issued by SGS Environmental Service for the on-site investigation done in 27-29 August 2009 at both Sasolburg and Secunda, in which "The overall conclusion is that the instruments that are used in the monitoring system (N2O and Flow) comply with the standard." Is mentioned. - SGS's AST Report, done on 08 – 12th August 2008 - SGS's QAL2 Report, "Validation of N2O Measurements Sasol Nitro Plant in Sasolburg", February 2007 as period investigation, done actually on 18 February 2007 - SGS's QAL2 Report, "Validation of N2O Measurements Sasol Nitro Plant in Secunda", February 2007 as period investigation, done actually on 22 February 2007 - Calibration Certificate for Nitric Acid flowmeter in Sasolburg dated 11/04/2008, 05/08/2009, 23/10/2009 & 04/05/2010 (transmitter and sensors) calibrated by "Alpret Control Specialis", 18/01/2008 & 06/01/2009 at Secunda - Letter from Endress Hauser explaining about no special maintenance such as calibration	Various See the left column.	

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		required for Coriolis type flowmeters (nitric acid) but recommending only appearance inspection. - Certificate of calibration done on DP:812 , GE Druck, SN:8120007181 by Vaal-Tech Instrumentation who is accredited by the South African National Accreditation Systems (SANAS), dated 11 September 2008		
10	Sasol	<u>Quality of External/Internal Laboratory</u> - Example of hand writing records at Sasolburg including HNO3 concentration recorded every 2 hours reviewed during the site visit	Various See the left column.	
11	n/a	<u>Other Regular Maintenance other than Calibration</u> - No applicable record of planned maintenance other than calibration.	n/a	
12	Sasol, SGS	<u>Breakdown, Malfunction, Abnormality</u> - NOX logbook Reports in Excel file as the daily operation log of Sasolburg in which incidents were recorded, e.g. Compressor Failure, Electrical Storm, Lightning trip plant,. - ABB's maintenance log, dated 24/12/2008, 06/01/2009 done on N2O analyzer - Network Down Report at Secunda, took place on 18th Jun. 08 - Email from QAL2/AST provider SGS Environmental Service dated 10/01/2011, in which the opinion as an accredited laboratory on the way of treating measured data for the period of vacancy of Zero/Span check as well as the drift exceeded 2SD is stated.	Various See the left column.	
13	Sasol	<u>Data Measured and Recorded</u> - Samples of "Nitro Wet Plant 05H00 Daily Report" which is a printed out log from the control room, dated 07/02/2009, 07/03/2009 at Secunda - Samples of "Nitric Acid Production Report", dated 20/11/2008, 23/12/2008, 12/01/2009,	Various See the left column.	

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		17/01/2009, 19/01/2009, 08/02/2009, 17-18/03/2009, 01/04/2009, 07/04/2009, 10/04/2009, 26/04/2009, 07/05/2009, 28-29/06/2009, 10/08/2009, 21/09/2009 in which cumulative raw material input including NH3, HNO3 production, average nitric acid strength, nitric acid tank level, output (fed to Liquid Fertilizers plan) and "Online Time" are indicated at Secunda - "Dagverslag0910.xls" Daily operation data in Secunda, named "" for the period from Jul 09 to Jun 10		
14	MGM	<u>Calculation Spreadsheet</u> - "Sasolburg Baseline Emission Factor rev3.0.xls" , hourly data of all parameters and the determination of baseline emission factor, dated 07/12/2009 - "Sasolburg-Third project campaign (10 Aug 08 to 7 Dec 08)-ver 1.0.xls" , hourly data of all parameters and the determination of 3rd project emission factor as well as the amount of ERs, dated 11/01/2010 - "Sasolburg-Third project campaign (10 Aug 08 to 7 Dec 08)-ver 2.0.xls" , hourly data of all parameters and the determination of 3rd project emission factor as well as the amount of ERs, dated 13/10/2010 - "Sasolburg Fourth project campaign- ver 1.0.xls" , hourly data of all parameters and the determination of 4 th project emission factor as well as the amount of ERs, dated 26/02/2010 - "Sasolburg Fourth project campaign- ver 2.0.xls" , hourly data of all parameters and the determination of 4 th project emission factor as well as the amount of ERs, dated 15/10/2010 - "Sasolburg-Third project campaign (10 Aug 08 to 7 Dec 08)-ver 3.0.xls", the final version	Various See the left column.	

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		corrected in relation to CAR#6, submitted 13/08/2011 - "Sasolburg Fourth project campaign- ver 3.0, the final version corrected in relation to CAR#6.xls" , the final version corrected in relation to CAR#6, submitted 08/09/2011 - "Secunda Baseline Emission Factor Calculation 15 April 08.xls" , hourly data of all parameters and the determination of baseline emission factor, - "Secunda Baseline Emission Factor Re Calculation for Third project campaign-ver 2.0.xls" , hourly data of all parameters and the determination of baseline emission factor, dated 15/04/2010 - "Secunda Third Project Campaign-ver 2.0.xls" , hourly data of all parameters and the determination of 3rd project emission factor as well as the amount of ERs - "Secunda Third Project Campaign-ver 3.0.xls" , hourly data of all parameters and the determination of 3rd project emission factor as well as the amount of ERs, dated 13/10/2010 - "Secunda Fourth Project Campaign (2May 09 to 3Aug 09) -ver 1.0.xls" , hourly data of all parameters and the determination of 4th project emission factor as well as the amount of ERs, dated 26/02/2010 - "Secunda Fourth Project Campaign (2May 09 to 3Aug 09) -ver 2.0.xls" , hourly data of all parameters and the determination of 4th project emission factor as well as the amount of ERs, dated 13/10/2010 - "Secunda_Third_Project_Campaign-ver_3.0.xls" , the final version corrected in relation to CAR#3, submitted 13/08/2011 - "Secunda_Fourth_Project_Campaign_(1May_09_to_3Aug_09)_-ver_3.0.xls" , the final version corrected in relation to CAR#3, submitted 08/09/2011		

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
15	Sasol	<u>Cross-Checking</u> - Cross checking result of the amount of nitric acid produced at Secunda from 12/01/2008 to 27/01/2010, including daily comparison between mass balance data and meter reading (flow meter measurement) - "NOX WEEKLY REPORT" in Sasolburg as daily reports in which HNO3 production, N2O amount and the other operational parameters are reported, from Dec. 2007 to April 2010	Various See the left column.	
16	Heraeus South Africa, AIR LIQUIDE, AFROX	<u>Other External Data, Records</u> - "Fixed rate for 20th FTCPlus campaign" issued by Heraeus South Africa dated 4 March 2011 for 20th Campaign (for the campaign starting April 2010) added to the previous 8 campaigns since 10th campaign started January 2004 as the evidence of Gauze composition and supplier in Sasolburg, as well as the historic nitric acid production per campaignin Sasolburg - "15th campaign – 210 days – indicative rate" issued by Heraeus South Africa dated 25 June 208 for 15th Campaign (for the campaign starting end August 2008) added to the previous 9 campaigns since 6th campaign as the evidence of Gauze composition and supplier as well as the historic nitric acid production per campaignin Secunda. - "16th campaign – 210 days – indicative rate" issued by Heraeus South Africa dated 6th April 2009 for 16th Campaign (for the campaign starting June 2009) added to the previous 12 campaigns since 4th campaign as the evidence of Gauze composition and supplier as well as the historic nitric acid production per campaignin Secunda. - Certificate label on the cylinder of reference gas being used at Sasolburg for Span check issued by AIR LIQUIDE, analyzed at 2,547 ppmv in N2 gas, filled on 12-08-08 expires on	Various See the left column.	

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		12-08-09 - Certificate label on the cylinder of reference gas previously used at Sasolburg for Span check issued by AIR LIQUIDE, analyzed at 1,167 ppmv in N2 gas, filled on 24-03-06 expires on 24-03-07 - Certificate label on the cylinder of nitrogen gas being previously used at Secunda for Zero check issued by AFROX, 99.998% as the purity, dated 24 July 2008 - Certificate label on the cylinder of reference gas being previously used at Secunda for Span check issued by AIR LIQUIDE, filled on 10-08 expires on 08-09		
17	n/a	<u>Statistical Survey, Sampling</u> - N/A	n/a	
18	Sasol, Uhde, Heraeus	<u>Applicability Conditions</u> - The letter titled as "Re:Notes on 1973 design and test run data, Sasol HNO3 plant in Sasolburg, South Africa" dated 13 September 2006, providing the plant capacity data including old record as attachment made by Uhde, saying 522 ton 100% per day as the designed guaranteed minimum capacity and 556.8 ton 100% per day as demonstrated capacity in November 1973 - For Secunda, the latest certificate with regard to atmospheric pollution, "Registration in terms of the Atmospheric Pollution Prevention ACT, 1965(ACT 45 of 1965)" dated on 04.Jan 1999 for the nitric acid processes is stating 860 t 100%HNO3/d - Uhde's Technical Document dated on 02.09.83 - Sasolburg-design capacity and pressure. Pdf - letter from Heraeus dated on Oct and Nov 2006	Various See the left column.	

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
19	Sasol, Uhde	<u>Baseline, Historic Data</u> - Fax from Uhde dated on 23 Jan 2008 to justify the range of OT_{normal} 860-920 written in PDD for Secunda, saying that higher than 890 improves efficiency but also increase platinum losses, and that lower than 860 reduces efficiency drastically. - Historic hourly oxidization temperature at Sasolburg in the spreadsheet, used to determine permitted operating condition. - International Fertilizer Society "Proceedings 50" ISBN 0 85310 1760, as the external literature indicating typical normal range in general for medium pressure type - Sasolburg Hand writing logs of operating parameters, "NITRIC ACID LOGSHEET 1", "1B", "2B", dated on 08/10/2006, 2003-01-17, 28/10/2001	Various See the left column.	
20	n/a	<u>Leakage</u> - N/A	n/a	
21	Department of Environmental Affairs and Tourism	<u>Environment, Legislative Conformance</u> - Operation Permit of Nitric Acid plant at Sasolburg with regard to Atmospheric Air Pollution Prevention Act, 1965 issued by Department of Environmental Affairs and Tourism, issued on 28th December 2004 - Mail dated 14th February 2008 from Infrachem SHERQ, Environmental Services giving testimony in relation to legislative compliance with NO_x regulation	Various See the left column.	
22	Sasol	<u>QA/QC in general</u> - QMS Documents prepared specifically for CDM activities including Overview Project Management, Responsibilities and document control procedures, List of measuring	Various See the left column.	

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Ref. No.	Author/Editor / Issuer	Title/Type of Document. Publication place	Issuance and/or submission date(dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		equipment and calibration frequencies, etc. for both Sasolburg and Secunda		

PERIODIC VERIFICATION

“Point of Use Abatement Device to Reduce SF₆ emissions in LCD
Manufacturing Operations in the Republic of Korea (South Korea)” (3440)



Industrie Service

Annex 3: Appointment Certificates



Industrie Service

CERTIFICATE OF APPOINTMENT

Mr Yoshida, Yutaka, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	25.03.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		25.03.11	25.03.11	25.03.11		

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	25.03.11				
Financial Expertise					
Date					

Qualification in technical areas	
Technical Area	Date
3.1_Energy demand	25.03.11
5.1_4.9_11.1_12.1_Chemical process industries	25.03.11
11.2_GHG capture and destruction	25.03.11
1.1_4.10_Thermal energy generation...	12.10.11
1.2_Energy generation from renewable energy source	12.10.11
13.1_Waste handling and disposal	12.10.11
2.1_Electricity distribution	12.10.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.

In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference No. CMS-Z-0026/02.

Date	Signature
25.03.11	
12.10.11	



Industrie Service

CERTIFICATE OF APPOINTMENT

Mr Hammer, Martin, fulfills the requirements of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH to participate in audits.

Qualification applicable to						
Standard	CDM	JI	GS	VCS	VER	Other
Date	23.03.11					

Qualification as						
Status	Trainee	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date		23.03.11	23.03.11	23.03.11	31.03.11	

Other qualification					
Country Expertise					
Region	1	2	3	4	5
Date	23.03.11				
Financial Expertise					
Date	23.03.11				

Qualification in technical areas	
Technical Area	Date
1.2_Energy generation from renewable energy source	23.03.11
5.1_4.9_11.1_12.1_Chemical process industries	23.03.11

This appointment is valid for 1 year from its date of signature below and is bound by internal requirements of the Management System of the Certification Body "climate and energy" of TÜV SÜD Industrie Service GmbH.

In case of loss of validity of this certificate as per result of an assessment according internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference No. CMS-Z-0005/00.

Date	Signature
23.03.11	<i>Thomas Kleiser</i>
31.03.11	<i>Volody</i>