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Verification Report

MGM INTERNATIONAL
Initial Verification and Verification of the
First Monitoring Period

**“Sasol Nitrous Oxide Abatement Project”
in South Africa**

UNFCCC Ref. 0961

Report No. 1093650, Version 01

20 June 2008

**TÜV SÜD Industrie Service GmbH
Carbon Management Service
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Report No.	Date of first issue	Version:	Date of this revision	Certificate No.									
1093650	2008-06-20	01	-	-									
Subject:	Initial and First Periodic Verification of a CDM Project												
Executing Operational Unit:	TÜV SÜD Industrie Service GmbH Carbon Management Service Westendstr. 199 – 80686 Munich, Federal Republic of Germany												
Client:	MGM International 501 Brickell Key Dr., Suite 202 Miami, FL 33131 USA												
Contract approved by:	Werner Betzenbichler												
Report Title:	Initial Verification and Verification of the First Monitoring Period of the Sasol Nitrous Oxide Abatement Project												
Number of pages	24 (excluding annexes)												
Summary: TÜV SÜD Industrie Service GmbH has performed a verification of the CDM project: "Sasol Nitrous Oxide Abatement Project" in South Africa. The verification is based on the currently valid documentation of the UN Framework Convention on Climate Change (UNFCCC). In this context, the relevant documents are the "Marrakesh Accords". Sasol Nitro, a Division of Sasol Chemical Industries Limited, as well as MGM International are responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions of the project "Sasol Nitrous Oxide Abatement Project" on the basis set out within the project Monitoring and Verification Plan indicated in the final PDD version 5 dated 31 January 2007. The verifier confirms that the project is implemented as planned and described in the validated and registered PDD mentioned above. Installed equipment being essential for generating emission reduction runs reliably. The monitoring system is in place, is calibrated appropriately and the project is generating emission reduction as a CDM project. The verifier can confirm that the GHG emission reduction is calculated without material misstatements. Our opinion relates to the project's GHG emissions and resulting GHG emissions reductions reported and related to the valid and registered project baseline and monitoring, and its associated documents. Based on the information we have seen and evaluated we confirm the following statement: <u>Reporting period:</u> From 25-05-2007 to 1-10-2007 <u>Verified emission in the above reporting period:</u> <table> <tr> <td>Baseline emissions:</td> <td>357 346</td> <td>t CO₂ equivalents</td> </tr> <tr> <td>Project emissions:</td> <td>97 809</td> <td>t CO₂ equivalents</td> </tr> <tr> <td>Emission reductions:</td> <td>259 537</td> <td>t CO₂ equivalents</td> </tr> </table>					Baseline emissions:	357 346	t CO ₂ equivalents	Project emissions:	97 809	t CO ₂ equivalents	Emission reductions:	259 537	t CO ₂ equivalents
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Work carried out by: - Nikolaus Kröger - Konrad Tausche - Yutaka Yoshida - Cyprian Fusi			Internal Quality Control by: Werner Betzenbichler										

Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CR	Clarification Request
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
ER	Emission Reduction
FAR	Forward Action Request
GHG	Greenhouse gas(es)
JI	Joint Implementation
KP	Kyoto Protocol
MP	Monitoring Plan
MW	Megawatts
NGO	Non Governmental Organization
PDD	Project Design Document
TÜV SÜD	TÜV SÜD Industrie Service GmbH
UNFCCC	United Nations Framework Convention on Climate Change
VVM	Validation and Verification Manual

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1 INTRODUCTION

Sasol Nitro, a Division of Sasol Chemical Industries Limited. as well as MGM International have commissioned an independent verification by TÜV SÜD Industrie Service GmbH (TÜV SÜD) of its CDM project: “Sasol Nitrous Oxide Abatement Project” in South Africa.

Verification is the periodic independent review and ex post determination by the Designated Operational Entity / Independent Entity of the monitored reductions in GHG emissions during the defined verification period.

This report summarizes the findings of the initial and first periodic verification. It is based on the Initial Verification Report Template and on the Periodic Verification Report Template, both part of the Validation and Verification Manual (VVM) published by the International Emission Trading Association (IETA).

Initial and first periodic verification has been performed in one on-site mission. Each task comprised a desk review of the project documents including PDD, monitoring plan, validation report, monitoring report and further documentations.

The results of the validation were documented by DNV in the validation report: “Sasol Nitrous Oxide Abatement Project” in South Africa, report no. 2007-0195, revision no. 01, dated 2006-11-14. This final validation report indicates no remaining issues.

The verification team consists of the following personnel:

Nikolaus Kröger	TÜV SÜD Industrie Service GmbH	Assessment Team Leader
Konrad Tausche	TÜV SÜD Industrie Service GmbH	Project Manager, Team Leader
Yutaka Yoshida	TÜV SÜD Japan Ltd.	GHG Auditor
Cyprian Fusi	TÜV SÜD Industrie Service GmbH	Local expert, GHG Trainee

1.1 Objective

The objective of verification can be divided in Initial Verification and Periodic Verification:

- **Initial Verification:** The objective of an initial verification is to verify that the project is implemented as planned, to confirm that the monitoring system is in place and fully functional, and to assure that the project will generate verifiable emission reductions. A separate initial verification prior to the project entering into regular operations is not a mandatory requirement.
- **Periodic Verification:** The objective of the periodic verification is to verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan; further more the periodic verification evaluates the GHG emission reduction data and express a conclusion with a high, but not absolute, level of assurance about whether the reported GHG emission reduction data is “free” of material misstatements; and verifies that the reported GHG emission data is sufficiently supported by evidence, i.e. monitoring records. If no prior initial verification has been carried out, the objective of the first periodic verification also includes the objectives of the initial verification.

The verification shall consider both quantitative and qualitative information on emission reductions. Quantitative data comprises the monitoring reports submitted to the verifier by the project entity. Qualitative data comprises information on internal management controls, calculation pro-

cedures, and procedures for transfer, frequency of emissions reports, review and internal audit of calculations/data transfers.

The verification follows UNFCCC criteria, refer to the Kyoto Protocol criteria and the CDM rules and modalities as agreed in the Bonn Agreement and the Marrakech Accords.

1.2 Scope

Verification scope is defined as an independent and objective review and ex post determination by the Designated Operational Entity of the monitored reductions in GHG emissions. The verification is based on validated project design document including baseline. These documents are reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations. TÜV SÜD has, based on the recommendations in the Validation and Verification Manual, employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of CERs.

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

In January 2008 a Monitoring Report N°1 has been submitted, covering the period from 25 May, 2007 to 1 October, 2007. This monitoring report has been made publicly available at UNFCCC. The audit team has been provided with various documents showing the implementation of the project, such as procedures, manuals, equipment characteristics and further documents. Based on these documents, the on-site visit for the initial verification and the first periodic verification was carried out.

These documents serve as the basis for the assessment presented herewith.

Studying the existing documentation belonging to this project, it was obvious that the competence and capability of the audit team performing the verification has to cover at least the following aspects:

- Knowledge of Kyoto Protocol and the Marrakech Accords
- Environmental and Social Impact Assessment
- Quality assurance
- Technical aspects of N₂O projects
- Monitoring technologies and concepts
- Political, economical and technical conditions in host country

According to these requirements TÜV SÜD has composed a project team in accordance with the appointment rules of the TÜV certification body "climate and energy":

Nikolaus Kröger is environmental engineer and expert for emissions monitoring and quality assurance at the department "TÜV SÜD Carbon Management Service". He is located in the TÜV SÜD Hamburg office and is also engaged as personally accredited verifier in the EU-ETS serving the Northern German market. Being ghg auditor for sectoral scopes 1, 4, 5, 8, 9, 10, 11, 12, 13 and assessment team leader for CDM and JI projects he has already been involved in several CDM activities with a special focus on industrial non-CO₂ projects. Constitutive on 13 years experience at the department "Environmental Service" he verified many metallurgical plants, refineries, chemical plants, waste treatment and power plants and process engineering in many types of facilities. One of his former focal points had been implementation and calibration of complex automatic Environment-Data-Systems.

Konrad Tausche, the deputy head of the department "TÜV Carbon Management Service" is located in the head quarter in Munich. Because of his long term experience in environmental measurement technique he works as a GHG auditor with a special focus on the scope "Industrial Gases". The former head of department environmental measurement technique at the Frankfurt office of TÜV SÜD Industrie Service GmbH, supports the team since Dec. 2006. He has an academic background in physical and chemical engineering. An additional economic study was completed with the academic degree of a Master of Business Administration and Engineering (MBA and Eng.). In his experience of more than 15 years he verified a lot of different energy, chemical and incineration plants, emission control and mitigation projects.

Yutaka Yoshida is a production engineer and responsible for the carbon market of TÜV SÜD in Japan. He is working as GHG auditor and is recently involved in the several CDM projects most of which are N₂O (linked to the sectoral scope #5 defined under UNFCCC). He used to work as a project engineer for tyre manufacturing and had comprehensive responsibilities for various capital investment projects including development of new facilities/plants/equipment/products, modernization/refurbishment, production expansion, new factory construction, production improvement, energy conservation projects, total preventative maintenance, environmental legislative compliance, etc. And he received extensive training on all aspects of the flexible mechanism. For this specific project he was responsible for input to the technical aspects within the chemical industry and the contact to technical expert aside of Japanese project developer.

Cyprian Fusi is a GHG auditor (Trainee) at the "Carbon Management Service" in the head office of TÜV SÜD Industrie Service GmbH, Germany, and is a expert for projects in Africa. He holds a Master of Science (Dipl.-Ing) degree in electrical engineering. He has received training in the CDM validation and verification processes and has participated in several CDM project audits and workshops.

The audit team covers the above mentioned requirements as follows:

- Knowledge of Kyoto Protocol and the Marrakech Accords (All)
- Environmental and Social Impact Assessment (All)
- Skills in environmental auditing (Kröger, Tausche, Yoshida)
- Quality assurance (Kröger, Tausche, Yoshida)
- Production process for nitric acid (Kröger, Tausche, Yoshida)
- Business environment in the nitric acid industry (Kröger, Tausche, Yoshida)
- Monitoring concepts (Kröger, Tausche, Yoshida)
- Political, economical and technical framework conditions in host country (Fusi)

In order to have an internal quality control of the project, a team of the following persons has been composed by the certification body "climate and energy":

- Werner Betzenbichler (Head of the certification body "climate and energy")

1.3 GHG Project Description

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 Po-



tential (GWP) of 310. The current project activity takes place at two nitric acid plants owned by Sasol Nitro, Sasolburg and Secunda respectively.

This 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. Since the 1st project campaigns at both plants finished, 7th March 2007-1st Oct. 2007 at Sasolburg and 18th Apr. 2007-5th January 2008 at Secunda. the project proponent has issued the monitoring report for the period between the day of CDM registration on 25th May 2007 and 1st October 2007 as the 1st monitoring period.

2 METHODOLOGY

The project assessment aims at being a risk based approach and is based on the methodology developed in the Validation and Verification Manual, an initiative of all Applicant Entities, which aims to harmonize the approach and quality of all such assessments.

In order to ensure transparency, a verification protocol was customized for the project, according to the Validation and Verification Manual. The protocol shows, in a transparent manner, criteria (requirements), means of verification and the results. The verification protocol serves the following purposes:

- It organizes, details and clarifies the requirements a CDM/JI project is expected to meet;
- It ensures a transparent verification process where the verifier will document how a particular requirement has been proved and the result of the verification.

The verification protocol consists of four tables. The different columns in these tables are described in Figure 1.

The completed protocol is enclosed in Annex 1 to this report.

Initial Verification Checklist – table 1			
OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>Description of circumstances and further commendation to the conclusion.</i>	<i>This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Verification report. The Initial Verification has additional Forward Action Requests (FAR). FAR indicates essential risks for further periodic verifications</i>

Periodic Verification Checklist		
Table 1: Data Management System/Controls		
Expectations for GHG data management system/controls	Score	Verifiers Comments (including Forward Action Requests)
The project operator's data management system/controls are assessed to identify reporting risks and to assess the data management system's/control's ability to mitigate reporting risks. The GHG data management system/controls are assessed against the expectations detailed in the table.	A score is assigned as follows: Full all best-practice expectations are implemented. Partial a proportion of the best practice expectations is implemented Limited this should be given if little or none of the system component is in place.	<i>Description of circumstances and further commendation to the conclusion. This is either acceptable based on evidence provided (OK), or a Corrective Action Request (CAR) of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Verification report. The Initial Verification has additional Forward Action Requests (FAR). FAR indicates essential risks for further periodic verifications</i>

Periodic Verification Checklist		
Table 2: GHG calculation procedures and management control testing		
Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
Identification of potential reporting risks based on an assessment of the emission estimation procedures. Identification of key source data. Focus on those risks that impact the accuracy, completeness and consistency of the reported data.	Identification of the key controls for each area with potential reporting risks. Assessment of adequacy of the key controls and eventually test that the key controls are actually in operation. Internal controls include, Understanding of responsibilities and roles, Reporting, reviewing and formal management approval of data; Procedures for ensuring data completeness, conformance with reporting guidelines, maintenance of data trails etc.	<i>Identification of areas of residual risks, i.e. areas of potential reporting risks where there are no adequate management controls to mitigate potential reporting risks</i> <i>Areas where data accuracy, completeness and consistency could be improved are highlighted.</i>

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

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including FARs)
<i>List of residual areas of risks of Periodic Verification Checklist Table 2 where detailed audit testing is necessary.</i> <i>In addition, other material areas may be selected for detailed audit testing.</i>	<i>The additional verification testing performed is described. Testing may include:</i> ▪ <i>Sample cross checking of manual transfers of data</i> ▪ <i>Recalculation</i> ▪ <i>Spreadsheet ‘walk throughs’ to check links and equations</i> ▪ <i>Inspection of calibration and maintenance records for key equipment</i> ▪ <i>Check sampling analysis results</i> <i>Discussions with process engineers who have detailed knowledge of process uncertainty/error bands.</i>	<i>Having investigated the residual risks, the conclusions are noted here. Errors and uncertainties are highlighted.</i>

Figure 1 Verification Protocol Tables

On-site visit for the verification

15th – 18th January 2008

Monitoring Period:

From 25th May 2007* to 1st October 2007**

* NOTE: The day of CDM registration. The 1st project campaign started on 7th March 2006 at Sasolburg and on 18th April 2007 at Secunda. Emission reduction made before this date is not included in their first monitoring report and is separately being applied for voluntary emission reduction.

** NOTE: The 1st project campaign finished on 1st October 2007 at Sasolburg and on 5th January 2008 at Secunda. Emission factors for both plants were calculated with data measured during whole 1st project campaign at each plant.

2.1 Review of Documents

The monitoring report submitted by the client and additional background documents related to the project performance were reviewed. A complete list of all documents reviewed is attached as Annex 2 to this report.

2.2 Follow-up Interviews

The on-site visit took place on 15th – 18th January 2008. This enabled to verify the project installation and the monitoring plan and both the emission reductions presented in the Monitoring report and all the raw data necessary to confirm such calculation.

Participants at this on-site verification on the part of Sasol Nitro, a Division of Sasol Chemical Industries Limited. as well as MGM International were shown in Annex 2 of this report.

2.3 Resolution of Clarification, Corrective and Forward Action Requests

The objective of this phase of the verification was to resolve the requests for clarification and any other outstanding issues which needed to be clarified for TÜV SÜD's positive conclusion on the GHG emission reduction calculation. The Clarification Requests, raised by TÜV SÜD were resolved during communication between the client and TÜV SÜD. Forward Action Requests are indicated issues which do not effect the generation of emission reduction in the verified period, but shall be improved in order to ensure the reliability of future data. To guarantee the transparency of the verification process, the concerns raised and responses that have been given are summarized in chapter 3 below and documented in more detail in the verification protocol in Annex 1.

3 VERIFICATION FINDINGS

In the following sections the findings of the verification are stated. The verification findings for each verification subject are presented as follows:

The findings from the desk review of the final monitoring report and the findings from interviews during the follow up visit are summarized. A more detailed record of these findings can be found in the Verification Protocol in Annex 1.

- 1) Where TÜV SÜD identified issues that needed clarification, corrective action or that represented a risk to the fulfillment of the project objectives, a Corrective Action Request or Clarification Request, respectively, was issued. The Requests are stated, where applicable, in the following sections and are further documented in the Verification Protocol in Annex 1. The verification of the project resulted in 5 Corrective Action Request and 14 Clarification Requests.
- 2) Where Corrective Action Requests and Clarification Requests have been issued, the exchanges between the Client and TÜV SÜD to resolve these Requests are summarized.
- 3) With Forward Action Requests, risks may be identified, which may endanger the delivery of high quality CERs in the future, i.e. by deviations from standard procedures as defined by the MP. As a consequence, such aspects should receive a special focus during the next consecutive verification. A FAR may originate from lack of data sustaining claimed emission reductions. Forward Action Requests are understood as recommendation for future project monitoring; they are stated, where applicable, in the following sections and are further documented in the Initial Verification Protocol in Annex 2. However FAR was not raised as all CARs and CRs have been clarified without leaving significant risks or concerns for the next verifications.
- 4) The final conclusions for verification subject are presented.

The verification findings relate to the project implementation as documented and described in the final monitoring report.

Initial Verification Findings

3.1 Remaining issues, CARs, FARs from previous validation

3.1.1 Discussion

Based on the validation report issued by DNV the verification team identified no missing steps. The project has been registered at the UNFCCC under the reference number 0961 on 25th May 2007.

3.1.2 Findings

None

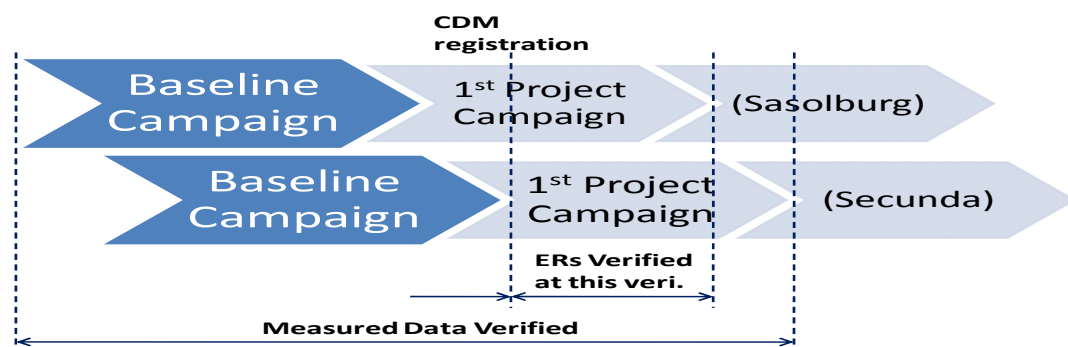
3.1.3 Conclusion

The requirements have been correctly addressed and the project complies with the requirements.

3.2 Project Implementation

3.2.1 Discussion

As mentioned above, the project campaign started prior to CDM registration. All measuring system had been installed before the start of baseline campaigns in accordance with the monitoring plan stated in the registered PDD. And the baseline campaigns at both plants had already finished when this CDM was registered at UNFCCC. After finishing the 1st project campaigns at both plants on 5th January 2008, emission factors were calculated with whole data measured during the entire period of both baseline campaigns and the project campaigns. Then, emission reductions achieved in the early period, before the day of CDM registration is being calculated and applied for VERs separately from this verification and one from CDM registration to 1st October 2007 which is the last day of the 1st project campaign at Sasolburg is subjected to this 1st periodic verification.



All measuring equipment described in PDD were installed including N₂O analyzers and tail gas flow meters. Their CDM related activities including personnel training and calibration / maintenance have been done as a part of their QMS certified with ISO9001. And applicable calibration records including QAL2 were found without deficiency at both plants to comply with auditors' spot checks. However, there were relatively many findings and discussions as mentioned at following sections in this report because this is the 1st verification of this CDM project without having an initial verification. In other words, the initial verification is combined to this 1st periodic verification. All findings including CARs, CRs and FARs were raised and responded with the Initial Verification Protocol attached in this verification report. The Periodic Verification Protocol was also issued after finalizing all findings and is attached to this report too.

3.2.2 Findings

Corrective Action Request #5

In MP, 2 PPs are stated compared to PDD in which only 1 PP is stated. I.e. Revised LoA and revised MoC have been submitted to UNFCCC. To finish verification, this inconsistency shall be resolved

Response

Revised LoA and MoC have been submitted.

3.2.3 Conclusion

The requirements have been correctly addressed and the project complies with the requirements.

3.3 Internal and External data

3.3.1 Discussion

There was no external data applied to calculate emission reductions, except uncertainty values determined with QAL2 results. E.g. emissions from ammonia production is not applicable as there was existing DE-NO_x units. Only few conditional parameters or qualitative information like QAL2 report, gauze composition, NO_x regulation were checked as external information. Compared, there were many internal data monitored. Most of them except e.g. hours of operation were automatically logged with DCS/DAC. As the audit team did not find a deficiency on calibration records, raw data were considered as reasonable basically.

To ensure credibility on data, cross checks were applied to check overall or rough consistency, in addition to their regular checks. The ways of such cross checking have been incorporated in their QMS certified.

Data were processed by MGM to calculate emission reductions with excel files. Protocols including filtering, exclusion and applying defaults or the last values were done with these excel files, and they were submitted to the audit team to be reviewed in addition to spot checks on raw data, logs, on screens.

3.3.2 Findings

Clarification Request #2:

With regard to Operation Temperature and Pressure at Sasolburg, a letter “Precious Metal Contents” issued by Heraeus dated Nov 22, 2006 states gauze composition as well as Operating Temperature (885 °C) and Operating Pressure (4.98 Bar for both), which are different from one stated in PDD, although there can be some difference from recommended values for gauzes because the ranges were determined with historic data at Sasolburg. Please clarify if the determined ranges are still within tolerable ranges compared to the preference of gauze manufacturer.

Response

The pressure and temperature ranges shown in the draft letter are indicative of the “preferred” condition for optimum catalyst gauze performance and warranties, without consideration to actual plant design, control capabilities and typical modes of operation; as such, they should be considered as reference only.

3.3.3 Conclusion

The requirements have been correctly addressed and the project complies with the requirements.

3.4 Environmental and Social Indicators

3.4.1 Discussion

No significant environmental and social indicators are defined in the monitoring plan, except the potentiality of N₂O regulation introduction as one of monitoring parameters in addition to legislative conformance to NO_x regulation as one of auditing subjects.

3.4.2 Findings

None

3.4.3 Conclusion

Conformance to NO_x regulation was verified and there was no sign of introducing N₂O regulation in the host country.

3.5 Management and Operational System

3.5.1 Discussion

The CDM activities were included in the scope of QMS certified with ISO9001 at both plants. In fact, elements of QMS were applied to CDM activities, e.g. about document control, maintenance and training. However such application did not look very specific and some weakness were found as mentioned below;

3.5.2 Findings

Clarification Request #1:

The maintenance history not only on measuring equipment but also data transmitting system are not immediately available and still rely on individual personnel with documented evidences like commissioning reports, contracts/agreements of purchasing/installation/maintenance, incidents/maintenance logs including report from subcontractors, hopefully in association with a list of critical measuring equipment and an overall plan/result of calibration/maintenance activities on them.

Response

In order to increase traceability, additional QMS procedures specific to CDM activities has been developed including lists, criteria and record filing.

3.5.3 Conclusion

The requirements have been correctly addressed and the project complies with the requirements.

Periodic Verification Findings

3.6 Completeness of Monitoring

3.6.1 Discussion

As mentioned above, all monitoring equipment were installed prior to the start of baseline campaigns and emission factors of both baseline campaigns and project campaigns were calculated after finishing the entire period of 1st project campaigns at both plants in January 2008. Then emission reductions achieved in the period from the day of CDM registration on 25th May 2007 until 1st October 2007 were calculated and stated in the monitoring report. Though the monitoring period reported does not cover entire period of the 1st project campaign at Secunda, this is considered to be reasonable as long as emission factors used to determine emission reductions were calculated with all data measured during entire period of both baseline and 1st project campaigns.

During the baseline campaign at Secunda, a problem occurred at N₂O analyzer. QAL3 as an element of EN14181 was not properly translated in their actual monitoring activities and the PP recognized the downtime more than 3 months after the start of the baseline campaign, i.e. the recorded values were significantly bigger than one to be.

Though the monitoring report was issued and disclosed prior to having the on-site verification, a way of treating these measured data was the most critical discussion at the on-site visit. Because it was not possible precisely to identify when the downtime began. As a conclusion, the audit team requested to apply conservative values either the conservative IPCC(4.5 kgN₂O/ton nitric acid) or the last measured value" to comply with the intention of the methodology. Sasol/MGM have complied with this request and corrected the way of calculation.

The measured data during the first week was considered to be sound because of the QAL1 certified analyzer and the successful installation proved with ABB's certificates. Then the baseline emission factor was assumed gradually to increase from the lowest value in the 1st week to the values recorded after the correction made on N₂O analyser. To make the baseline determination more conservative, the lowest value in the 1st week has been applied to the whole period between the start of the baseline campaign to the day on which emission factor was assumed to

reach to the conservative IPCC(4.5 kgN₂O/ton nitric acid). And the conservative IPCC(4.5 kgN₂O/ton nitric acid) has been applied to the rest of the downtime period.

The audit team verified and has accepted this way of baseline determination as sufficiently conservative way with graphic analysis in which the applied curve was indicated apparently lower than the assumed curve.

3.6.2 Findings

Corrective Action Request #1:

Shewhart chart is used as QAL3, using zero/span check results on N₂O analysers however there are to be further elaborated.

Missing UCL(Upper Control Limit)/LCL(Lower Control Limit) on the chart at Sasolburg. This can make the chart useless. UCL/LCL—i.e. statistical control limit shall be calculated from previous actual distribution with 3 sigma (Not to be confused to USL(Upper Specification Limit)/LSL(Lower Specification Limit)—i.e. tolerance)

Response

This has been corrected without raising significant concern on the reliability of measured data. And the guidance of QAL3 including trouble shooting has been developed as mentioned in the response and the result was submitted in an Excel file.

Clarification Request #7:

Shewhart chart is used as QAL3, using zero/span check results on N₂O analysers however there are to be further elaborated.

- 1) As the purpose of using Shewhart chart is to find a sign of abnormality on the measuring system. Usually there should be criteria/definition of abnormality on measured data to initiate investigation before having actual malfunctioning, e.g. out of UCL/LCL, consecutive increase/decrease, too narrow distribution, one sided distribution, etc. (although such abnormality does not immediately mean actual abnormality on the measuring system.)
- 2) In case of abnormality found, such incidents/reasons should be logged on the chart to make the tool more useful as one of typical practice
- 3) Such statistical control chart like Shewhart could be useful to maintain accuracy on flow volume measurement too, if flow volume has normal distribution. Not with periodic test, but just with measured values. Because, in case significant incident takes place on the flow volume measurement systems, distribution can be changed. Such study can periodically be done with recorded data easily, and it could find a problem on transmitting system.

Response

Specific procedures for maintaining this statistical process control has been developed and implemented.

3.6.3 Conclusion

The calculation of emission reduction is sufficiently conservative and in compliance with the intention of the methodology as well as the registered monitoring plan stated in PDD.

3.7 Accuracy of Emission Reduction Calculations

In addition to accuracy on raw data, data processing has risks to make inaccurate results. Because operating conditions shall be monitored during baseline campaigns and N₂O data shall be eliminated when such conditions are out of permitted ranges. In addition, there were occasional errors on AMS and such abnormal data shall be displaced with conservative values.

As a result of audit teams' first review on the monitoring report as well as excel files used for calculation, several mistakes were found as below, and the audit team requested thorough review and correction on ways of calculation as well as on the monitoring report.

3.7.1 Findings

Clarification Request #8:

Data processing protocol including primary filtering on raw data and secondary filtering/calculation on Excel data, i.e. from start to end to determine ERs, are to be comprehensively checked their soundness or adequacy because of following concerns or problems.

At Secunda, measured raw data are filtered with data min. limit e.g. 0 value from N₂O analyser, 400°C for gauze temperature to be eliminated. But its adequacy might better be checked from various point of view (This is not to require unconditional data archiving)

At both plants, OH_{project}, the operating hours is to be determined with signals of both ammonia and air flow in accordance with the page 42 of the PDD. However, as stated in C.1., significant part of the baseline campaign operation at Sasolburg was still out of the permitted operating range "in the calculation" because of low temperature data from "cold start". Therefore, the filtering for the purpose between to verify operating conditions and to determine operating hours would better be separated.

At Sasolburg, 3 temperature sensors are installed to monitor the reactor temperature. And it was explained that the mean value was used to control. On the other hand, the average seems to be used for the comparison of operating conditions. Please check if this is true or not.

Response

In addition to few corrections on data filtering protocol on xls files, CDM_EB's answer to the clarification request about interpretation of AM0034, AM_CLA_0063 helped to simplify this discussion so that a PP can remove just VSGBC and NCSGBC data for hours when the conditions are out of the permitted operating ranges, whether the status precisely is "operating" or not for baseline calculation.

Clarification Request #3:

In the QAL2 report for both plants issued by SGS, an accredited testing laboratory, the determined uncertainty as a result of QAL2 study is stated as ""The overall expanded uncertainty (95% Confidence Level) is +/-x.xx%" "The overall uncertainty is calculated for #1 Line as +/-x.xx%" And the latter value seems to be based on 68% as Confidence Level in the latter page. As the auditor's understanding about "uncertainty" referred in EN14181, "the overall uncertainty at CL95%" is to be applied. Therefore, the project proponent is expected to ask SGS mentioned above of explaining which uncertainty is to be applied to comply with EN14181.

Response

Justification was provided. Though the example stated in EN14181 is only about EU Directives, the host country does not have applicable requirements. And thus, applying the same definition as one for EU has been regarded as reasonable interpretation.

Clarification Request #6

As they are now operating a project campaign, the concentration of N₂O being measured is much lower than one used as a reference gas for span check at both plants. As measurement characteristics is not linear in many cases, span check should be carried out with the similar value to one being measured in general. And if measurement range is adjustable, it should be optimized too. In addition, the tolerance, e.g. +/- 20ppm seemed too strict compared to assured accuracy of the reference gas which is 3%. (2% is seen in most cases as the audit teams' experience by the way)

Response

Further explanation was provided and as a result the auditor has accepted reliability on measured data in this specific monitoring period because of following reasons;

- 1) the linearity is not an unstable characteristic in the manufactures' specifications
- 2) It is reasonable that successful result on the linearity test at QAL2 is effective until the due date of the next AST.
- 3) Using 1,000 ppmv span gas is proper at least for the baseline campaigns as well as for the measuring range

Clarification Request #9

In the page 9 of MR for Sasolburg plant, 7,671 kg NH₃/hr as the AFR_{BC}, the Baseline Anmonia Flow Rate is stated however it is bigger than 6,771 , the AFR_{max} stated in the PDD. This may be a mistake of 6,671 but please clarify this anyway.

Response

Corrected to 5,819 kg NH₃/hour as the average

Corrective Action Request #2

In the page 15 of MR, BE_{BC} for the 1st project campaign at Sasolburg plant is recalculated because it was shorter than the normal campaign length. However only NAP_{BC} is changed to smaller value without changing NCSG_{BC} value. The methodology states about Shorter Project Campaign in the page 10 -11 as "If CL_n < CL_{normal}, recalculate EF_{BL} by eliminating those N₂O values that were obtained during the production of tones of nitric acid beyond the CL_n(i.e. the last tones produced) from the calculation of EF_n." Therefore recalculated NCSG_{BC} value is to be applied instead.

Response

NCSG_{BC} has been corrected to comply with shorter project campaign length. Simultaneously other values like NAP_{BC} and VSG_{BC} as well as overall result, i.e. EF_{BC} has been recalculated in the same way.

3.7.2 Conclusion

The excel files and monitoring report revised were carefully reviewed and the audit team found no errors from spot checks on them.

3.8 Quality of Evidence to Determine Emission Reductions

As mentioned above, CDM activities were incorporated into Sasol's overall QMS certified with ISO9001. However the audit team was not really able to have applicable evidences and had to wait for them after the on-site visit, mentioned as follows. In other words, it was not easy for the audit team to confirm conformance with plans or rules. It was still okay as there was no deficiency as a result. However they could elaborate their ways of doing to make them more easily verifiable.

3.8.1 Findings

Corrective Action Request #3:

Though the applicable calibration records were found without deficiency at both plants at least to comply with several individual questions from the auditors about specific equipment for specific timing. It was difficult to have confidence about the overall compliance with established calibration plans, as there was not something like a comprehensive list of key equipment accompanying with documented calibration schedule or frequency, the tolerances and/or criteria for calibration, etc.

Response:

More specific procedures have been developed. And accepted by the audit team as, Firstly, all applicable records requested were available at least for this first verification. Secondly, what they were doing has been reasonably documented in their QMS documents including Critical instrumentation equipment – CDM Project Activities list.

Long term conformance with these procedures will be checked at following verifications as one of normal subjects.

Clarification Request #5:

At Secunda, the certificate label was missing on the cylinder connected to the analyser. As it was not provided to the audit team at the on-site visit, effectiveness and specification of the reference gas has not yet been verified. Please provide one for the cylinder being used.

Response:

The copy of the label has been submitted to prove its' effectiveness.

Clarification Request #12:

In PDD, "cross check" is talked about various parameters in PDD, e.g. OH_{BC} , NAP, AFR_{BC} , CL. However the result of such effort was not really visible. Because, even if those parameters interact each other, values do not precisely coincide and just a list of values does not usually imply specific information. If appropriate, graphical tool would be considered to make such work easier.

Response:

Specific procedures have been developed in their QMS and they were submitted with actual outcome from such cross checks.

Clarification Request #13:

With regard to EF_{reg} monitoring, the current consequence has no defect. However which information are to be monitored and recorded to demonstrate monitoring activities would be identified more clearly.

Response:

Evidences of the communications between Sasol and the Environmental National Authorities have been sent to the audit team. Regarding to future monitoring of EF_{reg}, CDM Manuals in its chapter 2 "Monitoring of Legislation referring to N₂O and NO_x emission limits" explain how the changes on the legislations will be monitored

3.8.2 Conclusion

Findings have been clarified with sufficient evidences and risks/concerns have been mitigated with additional procedures established to define what to do.

3.9 Management System and Quality Assurance

3.9.1 Discussion

As mentioned in 3.5 above, The CDM activities were included in the scope of QMS certified with ISO9001 at both plants. In fact, elements of QMS were applied to CDM activities, e.g. about document control, maintenance and training. The minutes of management review specifically states about some CDM issues. However such application did not look very specific and some weakness were found as mentioned below;

3.9.2 Findings

Clarification Request #10:

There are some tasks demanding special knowledge like zero/span check, Shewhart chart. However, a weakness was found on such tasks e.g. in accordance with CAR#1 and FAR#3, applicable procedures to identify training needs seemed not sufficiently to work. Please check.

Response:

Specific procedures have been developed in their QMS and thus the risks have been sufficiently mitigated.

Clarification Request #11:

With regard to trouble shooting procedures, previous problem on N₂O Analyser found in last December has deteriorated credibility of previously measured data significantly. Correction on analyser as well as introduction of weekly zero/span check were made immediately however credibility of data measured before finding a problem may have not yet been fully evaluated. The same problem can happen at calibration and immediate investigation both on cause and credibility of previously measured data should be done as well as consideration of increasing calibration frequency, in general. And quick investigation may make subcontractor's or manufacture's involvement easier.

As a failure of monitoring system can immediately result in losing credibility of measured data with regard to CDM activities of which consequence can be very different from one for

production activities. From this point of view, CDM specific trouble shooting procedures would be more clearly established and documented for various kind of possible but specific incidents, e.g. failure at calibration, Zero/Span check, malfunction, abnormality on Shewhart chart, etc.

Response:

Specific trouble shooting procedures at Zero/Span checks have been developed in their QMS to comply with this finding. The result will be checked by a verifier at next occasions as one of normal verification subjects.

Corrective Action Request #4:

The methodology requires data archiving both in electronic and paper formats however how data is archived in paper format has not yet clearly been identified.

Response:

Both plants will create hard copy backups based on daily averages. Files will be available for future verification audits. Chapter 5 of the CDM Manuals "Data management and storage" will be modified in order to describe procedure for hard data archiving.

Clarification Request #14:

The methodology requires data archiving mostly for 2 years or for entire crediting period which can be 21 years. Although this request is very CDM specific and different from ordinary QA or accounting procedures, such requirements are not incorporated in QMS documents.

Response:

The rule has been stipulated in "Safeguarding of data & long term data storage.doc"

3.9.3 Conclusion

There was none of deficiencies on data and calculation but above findings were about procedures or risks. Such risks and concerns have been reasonably mitigated.

Project Scorecard

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

4 VERIFICATION STATEMENT

TÜV SÜD Industrie Service GmbH has performed a verification of the CDM project: "Sasol Nitrous Oxide Abatement Project" in South Africa. The verification is based on the currently valid documentation of the UN Framework Convention on Climate Change (UNFCCC). In this context, the relevant documents are the "Marrakesh Accords".

Sasol Nitro, a Division of Sasol Chemical Industries Limited, as well as MGM International are responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions of the project "Sasol Nitrous Oxide Abatement Project" on the basis set out within the project Monitoring indicated in the final PDD version 5 dated 31 January 2007.

The verifier confirms that the project is implemented as planned and described in the validated and registered PDD mentioned above. Installed equipment being essential for generating emission reduction runs reliably. The monitoring system is in place, is calibrated appropriately and the project is generating emission reduction as a CDM project.

The verifier can confirm that the GHG emission reduction is calculated without material misstatements. Our opinion relates to the project's GHG emissions and resulting GHG emissions reductions reported and related to the valid and registered project baseline and monitoring, and its associated documents. The verifier confirms also that the monitoring plan of the project activity is in accordance with the applied methodology.

Based on the information we have seen and evaluated TÜV SÜD confirms the following statement:

Reporting period: From 25-05-2007 to 1-10-2007

Verified emission in the above reporting period:

Baseline emissions:	357 346	t CO ₂ equivalents
Project emissions:	97 809	t CO ₂ equivalents
Emission reductions:	259 537	t CO ₂ equivalents

Munich, 2008-06-20



Werner Betzenbichler

Head of certification body
„Climate and Energy“

Munich, 2008-06-20



Nikolaus Kröger

Project manager

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Annex 1: Initial Verification Protocol

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Initial Verification Checklist

OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
A. Opening Session		
A.1. Introduction to audits	A brief presentation about the objectives of an Initial Verification as well as the following procedures, e.g. CAR, FAR and CR were made by the auditor at the opening session.	☒
A.2. Clarification of access to data archives, records, plans, drawings etc.	The verification team got open access to all required plans, data, records, drawings and to all relevant facilities.	☒
A.3. Contractors for equipment and installation works <i>Who has installed the equipment? Who was contracted for planning etc.?</i>	All measuring equipment described in PDD were installed including ABB URAS 14, an infrared gas analyser, Rosemount 485 Annubar a pressure differential type gas flow meter at Secunda and an ultrasonic type Flowsick 100 at Sasolburg. At Sasolburg, it was said that all critical monitoring equipment including reactor temperature and pressure sensors, flow meters were renewed prior to start the baseline campaign. And applicable calibration records were found without deficiency at both plants to comply with several questions about specific equipment sampled. <u>Clarification Request #1.</u> The maintenance history not only on measuring equipment but also data transmitting system are not immediately available and still rely on individual personnel with documented evidences like commissioning reports, con-	<u>CR #1.</u>

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	tracts/agreements of purchasing/installation/maintenance, incidents/maintenance logs including report from subcontractors, hopefully in association with a list of critical measuring equipment and an overall plan/result of calibration/maintenance activities on them. To raise an instance at Secunda but the issue is not limited to Secunda, a report or a record was not provided from Emerson who was verbally explained as a supplier including installation work for Annubar. As QAL2 report does not report a problem on tail gas measurement, an actual problem is not found in the consequence however the following story could be a bad example. ABB's commissioning and calibration report was retained though it does not provide information more than a completion of commissioning in August 2006, without specifying the date and what were done at installation and commissioning. Then, this N2O Analyzer caused significant drift found in December 06. Though they did not comply with ABB's "recommendation" of monthly zero/span checking, reason is still unknown as ABB's "Re-calibration" report dated 13 Dec. 2006 does not discuss possible reasons but simply state calibration results. If the reason was supposed to be monthly zero/span check, this should be recognized as "must" maintenance at the beginning. A record or a report is just a part of maintenance activities however it interacts to various issues e.g. sufficient communication including one internal to have common recognition about what to do, and/or one external to subcontractors/suppliers. And with such records, maintenance activities should be verifiable to prove that all critical monitoring equipment has been sufficiently maintained from start (at least to start baseline campaign) to end.	
A.4. Actual status of installation works <i>Project installation should be finished at time of</i>	All measurement equipment is installed and works properly. Neither a problem nor a concern was observed on any equipment at the on-site visit.	☒

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
<i>initial verification in so far as the project should be ready to generate emission reductions afterwards.</i>		
B. Open issues indicated in validation report <i>Especially in projects which are not yet registered at CDM-EB or JI-SB, there might be some outstanding issues which should have been indicated by the validation report.</i>		
B.1. Missing steps to final approval	The validation report does not state any open issues. The project is already approved by the UNFCCC under the project number 0961. http://cdm.unfccc.int/Projects/DB/DNV-CUK1171877538.97/view	☒
C. Implementation of the project <i>This part is covering the essential checks during the on-site inspection at the project's site, which is indispensably for an initial verification</i>		
C.1. Physical components <i>Check the installation of all required facilities and equipment as described by the PDD.</i>	To ensure the conformity with the conditions of “Applicability” specified in the methodology, “designed capacity” of nitric acid production at 2 plants at the end of 2005, official certificates for continuing plant operation and design documents were checked and the result was successful for both plants. 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. Foe Secunda, the latest certificate with regard to atmospheric pollution, “Reg-	

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	istration in terms of the Aomospheric 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. Gauze Compositions, GC_{normal} are consistent with a specification including one for histic campaigns, called “Precious Metal Contents” provided by Heraeus, dated Nov 22, 2006. Both plant use PTCPlus however composition is slightly different and such difference is also sated 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 “indicative 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 re-newed at start of the baseline campaign at both Sasolburg and secunda. <u>Clarification Request #2.</u> With regard to Operation Temperature and Pressure at Sasolburg, a letter “Precious Metal Contents” issued by Heraeus dated Nov 22, 2006 states gauze composition as well as Operating Temperature (885 °C) and Operating Pressure (4.98 Bar for both), which are different from one stated in PDD, although there can be some difference from recommended values for gauzes because the ranges were determined with historic data at Sasolburg. Please	<u>CR #2.</u>

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	clarify if the determined ranges are still within tolerable ranges compared to the preference of gauze manufacturer. The normal Historic Campaign Length CL_{normal} are consistent to one in the sources, e.g. for Secunda, the average of produced NA amount from 6th to 10th campaigns stated in the letter from Heraeus titled “Re: 14th campaign -210 days – fixed rate” indicates actual history for 4th -12th (12th as the baseline) are consistent to one in PDD.	
C.2. Project boundaries <i>Check whether the project boundaries are still in compliance with the ones indicated by the PDD.</i>	The boundaries are the same as described in the PDD.	☒
C.3. Monitoring and metering systems <i>Check whether the required metering systems have been installed. The meters have to comply with appropriate quality standards applicable for the used technology.</i>	All necessary equipment is installed (details see A.3.)	☒
C.4. Data uncertainty <i>How will data uncertainty be determined for later calculations of emission reductions? Is this in compliance with monitoring and metering equipment?</i>	<u>Clarification Request #3.</u> In the QAL2 report for both plants issued by SGS, the determined uncertainty as a result of QAL2 study is stated as “The overall expanded uncertainty (95% CL) is +/-x.xx%” “The overall uncertainty is calculated for #1 Line as +/-x.xx%” And the latter value seems to be based on CL68% in the latter page. As the auditor’s understanding about “uncertainty” referred in EN14181, “the overall uncertainty at CL95%” is to be applied. Therefore, the project proponent is expected to ask SGS of explaining which uncertainty is to be applied	<u>CR #3.</u>

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	to comply with EN14181.	
C.5. Calibration and quality assurance <i>Check how monitoring and metering systems are subject to calibration and quality assurance routines</i> <i>a) with installation</i> <i>b) during future operation</i>	<u>Clarification Request #4.</u> Though the applicable calibration records were found without deficiency at both plants at least to comply with several individual questions from the auditors about specific equipment for specific timing. It was difficult to have confidence about the overall compliance with established calibration plans, as there was not something like a comprehensive list of key equipment accompanying with documented calibration schedule or frequency, the tolerances and/or criteria for calibration, etc. With regard to Zero/Span check on N2O analyzers, At Sasolburg, the certificate label on the cylinder of reference gas installed and used for Span check was “Required:2,500 ppm, Analysed:2547ppm, Tolerance:+/-3%, filled on 14/08/2007, Expiry:14/08/2008”. And the result of the demonstration with that span gas was 2577 ppm. <u>Clarification Request #5.</u> At Secunda, the certificate label was missing on the cylinder connected to the analyser. As it did not provided to the audit team at the on-site visit, effectiveness and specification of the reference gas has not yet been verified. Please provide one for the cylinder being used. In accordance with the label on the other vacant cylinder, the specification seems “Required: 1,000 ppm, Analysed 1167 ppm, Tolerance:+/-3%”. <u>Clarification Request #6.</u> However, as they are now operating a project campaign, the concentration of	<u>CR #4.</u> <u>CR #5.</u> <u>CR #6.</u>

OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	N2O being measured is much lower than one used as a reference gas for span check at both plants. As measurement characteristics is not linear in many cases, span check should be carried out with the similar value to one being measured in general. And if measurement range is adjustable, it should be optimized too. In addition, the tolerance, e.g. +/- 20ppm seemed too strict compared to assured accuracy of the reference gas which is 3%. (2% is seen in most cases as the audit teams' experience by the way) <u>Corrective Action Request #1.</u> Shewhart chart is used as QAL3, using zero/span check results on N2O analysers however there are to be further elaborated. 1) Missing UCL/LCL on the chart at Sasolburg. This can make the chart useless. UCL(Upper Control Limit)/LCL(Lower Control Limit)—i.e. statistical control limit shall be calculated from previous actual distribution with 3 sigma (Not to be confused to USL(Upper Specification Limit)/LSL(Lower Specification Limit)—i.e. tolerance) <u>Clarification Request #7.</u> 2) As the purpose of using Shewhart chart is to find a sign of abnormality on the measuring system. Usually there should be criteria/definition of abnormality on measured data to initiate investigation before having actual malfunctioning, e.g. out of UCL/LCL, consecutive increase/decrease, too narrow distribution, one sided distribution, etc. (although such abnormality does not immediately mean actual abnormality on the measuring system.) 3) In case of abnormality found, such incidents/reasons should be logged on the chart to make the tool more useful as one of typical practice	<u>CAR#1.</u> <u>CR #7.</u>

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	4) Such statistical control chart like Shewhart could be useful to maintain accuracy on flow volume measurement too, if flow volume has normal distribution. Not with periodic test, but just with measured values. Because, in case significant incident takes place on the flow volume measurement systems, distribution can be changed. Such study can periodically be done with recorded data easily, and it could find a problem on transmitting system.	
C.6. Data acquisition and data processing systems <i>Check the eligibility of used systems.</i>	The Data Acquisition System consists mainly of the PLC which scans the data on every 2 seconds at Sasolburg and every second at Secunda and route them to raw data storage. At Secunda the data storage is configured with RAID 5 so that the data is protected from a crash on a hard disk unit. Excel files are created from such raw data to calculate <u>Clarification Request #8.</u> Data processing protocol including primary filtering on raw data and secondary filtering/calculation on Excel data, i.e. from start to end to determine ERs, are to be comprehensively checked their soundness or adequacy because of following concerns or problems. At Secunda, measured raw data are filtered with data min. limit e.g. 0 value from N₂O analyser, 400°C for gauze temperature to be eliminated. But its adequacy might better be checked from various point of view (This is not to require unconditional data archiving) At both plants, OH_{project}, the operating hours is to be determined with signals of both ammonia and air flow in accordance with the page 42 of the PDD. However, as stated in C.1., significant part of the baseline campaign operation at Sasolburg was still out of the permitted operating range “in the calculation” be-	<u>CR #8.</u>

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	cause of low temperature data from “cold start”. Therefore, the filtering for the purpose between to verify operating conditions and to determine operating hours would better be separated. At Sasolburg, 3 temperature sensors are installed to monitor the reactor temperature. And it was explained that the mean value was used to control. On the other hand, the average seems to be used for the comparison of operating conditions. Please check if this is true or not. Record archiving period	
C.7. Reporting procedures <i>Check how reports with relevance for the later determination of emission reductions will be generated</i>	Two monitoring reports for the period from 7th March 2007 to 1st October 2007 have been issued. As the registration date of CDM is 25th May 2007, the report for the earlier period is issues for VER. The report for the later period is for CDM and it only is referred as “MR”, Monitoring Report below. Reduction of N₂O concentration achieved at Secunda is 1,702 mgN₂O/Nm³ (NCSG_{BC}) > 663 (NCSG_{project}) is significantly less than one at Sasolburg 3,003 > 371. This is much worse than “90%” used in PDD to make ex-ante estimation too. The reason was explained to be sudden shift of the gauzes though this is not a problem on ERs calculation. As CR #8 is stated in C.6., the data handling protocol from raw data to the consequence of ERs calculation because of following reason as well. The statistical comparison between the average of historic temperature data and the average of baseline data was done with t-distribution analysis and concluded as okay. On the other hand, 25 % of baseline campaign is out of the permitted operating range at Sasolburg and the reason seems to be sig-	

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	nificant mavericks. If the distribution does not have good shape because of mavericks, statistical study won't make a credible result. Therefore, the data handling protocol is to be corrected to eliminate such mavericks. >> To be clarified comprehensively as a part of <u>CR #8</u> As mentioned in A.3., significant drift of measured data from N2O Analyser was found in mid December after starting the baseline campaign at Secunda at the end of August. Although data collected at the beginning of the baseline campaign can be thought to be credible as ABB's calibration at installation was recorded, when the drift grew significant is unknown at a moment as monthly zero/span check was not done during that period in accordance with ABB's recommendation because of availability of N2O reference gases. This is not “down” of the measuring system referred in the page 22 of the methodology however credibility of data measured is unknown as e.g. there is no opinion from ABB about possible behaviour of measured values under such condition. Although connection with straight line from start to the point of correction is thought to be reasonably conservative at least technically, the audit team does not have an immediate answer except for the way applying IPCC default and/or the lowest last measured. >> To be clarified comprehensively as a part of <u>CR #8</u> <u>Clarification Request #9.</u> In the page 9 of MR for Sasolburg plant, 7,671 kg NH₃/hr as the AFR_{BC}, the Baseline Anmonia Flow Rate is stated however it is bigger than 6,771 , the AFR_{max} stated in the PDD. This may be a mistake of 6,671 but please clarify this anyway.	<u>CR #9.</u>

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	<u>Corrective Action Request #2.</u> In the page 15 of MR, BE_{BC} for the 1st project campaign at Sasolburg plant is recalculated because it was shorter than the normal campaign length. However only NAP_{BC} is changed to smaller value without changing NCSG_{BC} value. The methodology states about Shorter Project Campaign in the page 10 -11 as “If CL_n < CL_{normal}, recalculate EF_{BL} by eliminating those N₂O values that were obtained during the production of tones of nitric acid beyond the CL_n(i.e. the last tones produced) from the calculation of EF_n.” Therefore recalculated NCSG_{BC} value is to be applied instead. <u>Corrective Action Request #3.</u> For several parameters, single values are stated in MR, e.g. “4.0 bar” for the Baseline Oxidation Pressure, “OP_{BC}” however unknown to identify the meaning of these values as the result is a mass data which have distribution. This may be average values, but please clarify.	<u>CAR#2.</u> <u>CAR#3.</u>
C.8. Documented instructions <i>Check whether the personnel performing tasks with sensitivity for the monitoring of emission reductions have access and knowledge of documented instructions, forming a part of the project’s management system.</i>	Both plant has been certified ISO 9001 and the scope includes nitric acid production. And several examples as procedures stipulate about CDM activities are found, including reporting. However, as CR #4 is mentioned in C.5., weak areas exist specially for monitoring activities. >> <u>See CR #4</u>	
C.9. Qualification and training <i>Check whether the personnel performing tasks with sensitivity for the monitoring of emission reductions has the appropriate competences, capabilities and qualifications to ensure the required data quality.</i>	In accordance with QMS certified ISO 9001, required competency been fulfilled, e.g. for personnel working for laboratory. <u>Clarification Request #10.</u> There are some tasks demanding special knowledge like zero/span check, Shewhart chart. However, as weakness was found on such tasks e.g. in accordance with CAR#1 and CR#7, applicable procedures to identify training	<u>CR #10.</u>

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	needs seemed not sufficiently to work. Please check.	
C.10. Responsibilities <i>Check whether all tasks required to gather data and prepare a monitoring report with the necessary quality have been allocated to responsible employees.</i>	The responsibilities are described in the PDD and procedures established as a part of QMS..	☑
C.11. Troubleshooting procedures <i>Check whether there are possibilities of redundant data monitoring in case of having problems with the used monitoring equipment. Such procedures may reduce risks for the buyers of emission reductions (e.g. the Client)</i>	No significant concern on the overall result. <u>Clarification Request #11.</u> With regard to trouble shooting procedures, previous problem on N2O Analyser found in last December has deteriorated credibility of previously measured data significantly. Correction on analyser as well as introduction of weekly zero/span check were made immediately however credibility of data measured before finding a problem may have not yet been fully evaluated. The same problem can happen at calibration and immediate investigation both on cause and credibility of previously measured data should be done as well as consideration of increasing calibration frequency, in general. And quick investigation may make subcontractor's or manufacture's involvement easier. As a failure of monitoring system can immediately result in losing credibility of measured data with regard to CDM activities of which consequence can be very different from one for production activities. From this point of view, CDM specific trouble shooting procedures would be more clearly established and documented for various kind of possible but specific incidents, e.g. failure at calibration, Zero/Span check, malfunction, abnormality on Shewhart chart, etc.	<u>CR #11.</u>
D. Internal Data <i>Identifying the internal GHG data sources and ways in which the data have been collected, calculated, processed, aggregated and stored should be part of initial verification to assess accuracy and</i>		

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
<i>reliability of the internal GHG data..</i>		
D.1. Type and sources of internal data <i>Acquire information on type and source of internal GHG data, which is used in calculations of emission reductions. E.g..” continuous direct measurements”, “site-specific correlations”, “periodic direct measurements”, “use of models” and/or “use of default emissions factors”.</i>	Most of measured data are obtained from PLC and not need to identify them individually as data in such electronics media are usually sorted out with names or information of columns and rows.	☑
D.2. Data collection <i>How is data collected and processed? What are the means of quantifying emissions from the different data sources?</i>	See D.1.	☑
D.3. Quality assurance <i>Does internal data collection underlie sufficient quality assurance routines?</i>	<u>Clarification Request #12.</u> In PDD, “cross check” is talked about various parameters in PDD, e.g. OH _{BC} , NAP, AFR _{BC} , CL. However the result of such effort was not really visible. Because, even if those parameters interact each other, values do not precisely coincide and just a list of values does not usually imply specific information. If appropriate, graphical tool would be considered to make such work easier.	<u>CR #12.</u>
D.4. Significance and reporting risks <i>Assess the significance and reporting risks related to the different internal data sources. Potential reporting risks may be related to the calculation methods, accuracy of data sources and data collection and/or the information systems from which data is obtained. The significance of and risks as-</i>	After solving all findings mentioned in this checklist there is no reporting risk.	

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
<i>sociated with the data source indicate the level of verification effort required at a later stage.</i>		
E. External Data <i>Especially for data of baseline emissions there might be the necessity to include external data sources. The access to such data and a proof of data quality should be part of initial verification. If it is deemed to be necessary, an entity delivering such data should be audited.</i>		
E.1. Type and sources of external data <i>Acquire information on type and source of external data, which is used in calculations of emission reductions</i>	There are no external data used in calculations of emission reductions. The only information is given by the composition and the supplier of the gauzes.	☒
E.2. Access to external data <i>How is data transferred? How can reproducibility of data set be ensured?</i>	See E.1.	☒
E.3. Quality assurance <i>Does external data underlie any quality assurance routines?</i>	See E.1.	☒
E.4. Data uncertainty <i>Is it possible to assess the data uncertainty of external data? Are such routines included in reporting procedures?</i>	See E.1.	☒
E.5. Emergency procedures	There are no external data used in calculations of emission reductions. The only information is given by the composition and the supplier of the	☒

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
<i>Are there any procedures which will be applicable if there is no access to relevant external data?</i>	gauzes.	
F. Environmental and Social Indicators <i>A Monitoring Plan may comprise environmental and/or social indicators which could be necessary to monitor for the success of the project activity.</i>		
F.1. Implementation of measures <i>A project activity may demand for the installation of measures (e.g. filtering systems or compensation areas), which are exceeding the local legal requirements. A check of the implementation or realization of such measures should be part of the initial verification.</i>	Besides the already existing monitoring of the NO_x-emissions there are no demands for the installation of measures due to environmental restrictions caused by the project activity. With regard to NO_x, the latest certificate with regard to atmospheric pollution, “Registration in terms of the Atmospheric Pollution Prevention ACT, 1965(ACT 45 of 1965)” dated on 2004/12/28 for the nitric acid processes of SASOL NI-TRO. And one of recent monthly report states 108 ppm as the monthly maximum << 250 ppm as legislative upper limit at Sasolburg. The same activities and conformance was checked with the documents dated 04. jan.1999, the certificate at Secunda. .	☒
F.2. Monitoring equipment <i>Check where necessary whether the required metering systems have been installed. The meters have to comply with appropriate quality standards applicable for the used technology.</i>	See F.1	☒
F.3. Quality assurance procedures <i>What quality assurance procedures will be applied for such data?</i>	<u>Clarification Request #13.</u> With regard to EF_{reg} monitoring, the current consequence has no defect. However which information are to be monitored and recorded to demonstrate	<u>CR #13.</u>

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
	monitoring activities would be identified more clearly.	
F.4. External data <i>Check the quality, reproducibility and uncertainty of external data.</i>	No external data are required by the project activity.	☒
G. Management and Operational System <i>In order to ensure a successful operation of a Client project and the credibility and verifiability of the ERs achieved, the project must have a well defined management and operational system.</i>		
G.1. Documentation <i>The system should be documented by manuals and instructions for all procedures and routines with relevance to the quality of emission reductions. The accessibility of such documentations to persons working on the project has to be secured.</i>	Basically CDM activities are integrated to ISO 9001 certified QMS including documentation in general. What they call “Data Handling Protocol”, which summarize the specific procedures and routines with relevance to the quality of emission reductions would better be documented >> See C.6.	
G.2. Qualification and training <i>The system should describe the requirements on qualification and the need of training programs for all persons working on the emission reduction project. Performed training programs and certificates should be archived by the system.</i>	See C.9 & C.10.	
G.3. Allocation of responsibilities <i>The allocation of responsibilities should be documented in written manner.</i>	See C.10.	☒

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OBJECTIVE	COMMENTS	Concl.(incl FARs/CARs)
G.4. Emergency procedures <i>The system should contain procedures which provide emergency concepts in case of unexpected problems with data access and/or data quality.</i>	See C.1. above.	
G.5. Data archiving <i>The system should provide routines for the archiving of all data which is required for verifying the project's performance in the context of consecutive verifications.</i>	<u>Corrective Action Request #4.</u> The methodology requires data archiving both in electronic and paper formats however how data is archived in paper format has not yet clearly been identified. <u>Clarification Request #14.</u> The methodology requires data archiving mostly for 2 years or for entire crediting period which can be 21 years. Although this request is very CDM specific and different from ordinary QA or accounting procedures, such requirements are not incorporated in QMS documents.	<u>CAR#4.</u> <u>CR #14.</u>
G.6. Monitoring report <i>The system includes procedures for the calculation of emission reductions and the preparation of the monitoring report.</i>	Monitoring report has been issued by MGM. <u>Corrective Action Request #5.</u> In MP, 2 PPs are stated compared to PDD in which only 1 PP is stated. I.e. Revised LoA and revised MoC have been submitted to UNFCCC. To finish verification, this inconsistency shall be resolved.	<u>CAR#5.</u>
G.7. Internal audits and management review <i>The system includes internal control procedures, which allow the identification and solution of problems at an early stage.</i>	Minutes of management refers clearly about CDM activities.	☑

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Table 2 Resolution of Corrective Action and Clarification Requests

Clarifications and corrective action requests by validation team	Ref. to table 1	Summary of project owner response	Validation team conclusion
<u>Clarification Request #1.</u> The maintenance history not only on measuring equipment but also data transmitting system are not immediately available and still rely on individual personnel with documented evidences like commissioning reports, contracts/agreements of purchasing/installation/maintenance, incidents/maintenance logs including report from subcontractors, hopefully in association with a list of critical measuring equipment and an overall plan/result of calibration/maintenance activities on them.	A.3.	In order to increase traceability of all activities related to maintenance and calibration on key instrumentation, several actions have been taken, among them, the revision/re-assessment of the key instrumentation list, the maintenance and calibration program and the implementation of the AMS logbook (which purpose is to capture all relevant events related to the AMS). Additional formats and procedures were created and integrated into the “CDM Manual”, a larger compilation of documents which purpose is to describe all relevant activities related to the CDM project at each plant, including ways and procedures for documented evidence filing and storage. The CDM manual of each plant is available for review by the Verification team. All documents of recent creation (non existing before Verification) were integrated into the ISO 9000 system of each facility.	☒ There is only insignificant concern left because there was no immediate deficiency found in the maintenance history as a result. And the procedures for CDM activities has been elaborated as the response to this finding. Thus, the concern in relation to this FAR has been well mitigated and does not specifically need to be forwarded to the next verification as a verifier will check this issue as one of usual subjects.
<u>Clarification Request #2.</u> With regard to Operation Temperature and Pressure at Sasolburg, a letter “Precious Metal Contents” issued by Heraeus dated Nov 22, 2006 states gauze composition as	C.1.	The selection of Normal Operating ranges was audited during Validation (see section D.4.1 or Validation report by DNV) finding plant procedures and evidence in accordance with AM0034.	☒ Clarified. It is considered as reasonable that single values as

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well as Operating Temperature (885 °C) and Operating Pressure (4.98 Bar for both), which are different from one stated in PDD, although there can be some difference from recommended values for gauzes because the ranges were determined with historic data at Sasolburg. Please clarify if the determined ranges are still within tolerable ranges compared to the preference of gauze manufacturer.		On separate documents evidence for procedure to select normal conditions are included. Regarding the letter from the gauze manufacturer declaring gauze composition, the official document contains the composition of catalyst for each plant only (perhaps the document to which reference is made to is a draft delivered to the Verifying team by mistake). The official copy is attached to our response. As per AM0034, catalyst supplier has the capacity to help determine ranges for ammonia load (flow) and ammonia/air ratio only; the pressure and temperature ranges shown in the draft letter are indicative of the “preferred” condition for optimum catalyst gauze performance and warranties, without consideration to actual plant design, control capabilities and typical modes of operation; as such, they should be considered as reference only.	recommended temperature and pressure by the gauze manufacture do not strictly restrain the operational ranges.
<u>Clarification Request #3.</u> In the QAL2 report for both plants issued by SGS, the determined uncertainty as a result of QAL2 study is stated as “The overall expanded uncertainty (95% CL) is +/-x.xx%” “The overall uncertainty is calculated for #1 Line as +/-x.xx%” And the latter value seems to be based on CL68% in the latter page. As the auditor’s understanding about “uncertainty” referred in EN14181, “the overall uncertainty at CL95%” is to be applied. Therefore,	C.4.	Regarding the justification for our choice in the calculations/verification report, as per the definition on the methodology (page 7, AM34 version 2.0), UNC = “Overall uncertainty of the monitoring system (%), calculated as the combined uncertainty of the applied monitoring equipment” (SGS reports: Overall uncertainty (so)) Also please review the definition of Uncertainty on EN14181 (section 3.5):	☒ Clarified. Though the example stated in EN14181 is only about EU Directives, the host country does not have applicable requirements. And thus, applying the same definition as one for EU has been regarded as reasonable

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the project proponent is expected to ask SGS of explaining which uncertainty is to be applied to comply with EN14181.		“... In this European standard, the standard deviation is estimated in the QAL2.... In the procedures of this standard, the premise is the required variability is given as so itself, or as a quarter of the length of the full 95% confidence interval.” Which confirms UNC = so	interpretation.
<u>Clarification Request #4.</u> Though the applicable calibration records were found without deficiency at both plants at least to comply with several individual questions from the auditors about specific equipment for specific timing. It was difficult to have confidence about the overall compliance with established calibration plans, as there was not something like a comprehensive list of key equipment accompanying with documented calibration schedule or frequency, the tolerances and/or criteria for calibration, etc.	C.5.	The CDM manual addresses concerns regarding organization and record keeping for calibration of key instrumentation (chapter 6 of manuals).	☒ Clarified. First, all applicable records requested were available at least for this first verification. Secondly, what they were doing has been reasonably documented in their QMS documents including Critical instrumentation equipment – CDM Project Activities list. Long term conformance with these procedures will be checked at following verifications as one of normal subjects.
<u>Clarification Request #5.</u> At Secunda, the certificate label was missing	C.5.	This certified label has been sent to TUV in separate document.	☒ Clarified as the copy of

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on the cylinder connected to the analyser. As it did not provided to the audit team at the on-site visit, effectiveness and specification of the reference gas has not yet been verified. Please provide one for the cylinder being used.			the label has been submitted to prove its' effectiveness.
<u>Clarification Request #6.</u> However, as they are now operating a project campaign, the concentration of N2O being measured is much lower than one used as a reference gas for span check at both plants. As measurement characteristics is not linear in many cases, span check should be carried out with the similar value to one being measured in general. And if measurement range is adjustable, it should be optimized too. In addition, the tolerance, e.g. +/- 20ppm seemed too strict compared to assured accuracy of the reference gas which is 3%. (2% is seen in most cases as the audit teams' experience by the way)	C.5.	As per Manufacturer's manual and technical information, the response of the NDIR module is linear within the whole analytical span (less than 1% deviation), thus the manufacturer has not seen the need of recommending using a different calibration gas. Furthermore, during QAL2 tests linearity checks were performed using several dilutions of the calibration gases (sections 3.4 and appendix 1 of QAL2 reports) finding the instruments pass the criteria for linearity and thus allowing the application of the same calibration function from zero N2O to the concentration of the calibration gases available at each plant. However if the Verification team feel strongly that calibration gases with a concentration closer to actual levels (with N2O abatement system) should be used, the project owner is willing to do so.	☒ The auditor has accepted reliability on measured data in this specific monitoring period because of following reasons; 1) the linearity is not an unstable characteristic in the manufactures' specifications 2) It is reasonable that successful result on the linearity test at QAL2 is effective until the due date of the next AST. 3) Using 1,000 ppmv span gas is proper at least for the baseline campaigns as well as for the

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			measuring range
<u>Corrective Action Request #1.</u> Shewhart chart is used as QAL3, using zero/span check results on N2O analysers however they are to be further elaborated. Because there are no UCL(Upper Control Limit)/LCL(Lower Control Limit) on the chart at Sasolburg. This can make the chart useless. UCL/LCL—i.e. statistical control limit shall be calculated from previous actual distribution with 3 sigma (Not to be confused to USL(Upper Specification Limit)/LSL(Lower Specification Limit)—i.e. tolerance)	C.5.	CDM Manuals at Secunda plant and Sasolburg plant respectively include instructions regarding how Shewhart Charts must be used. Those instructions are in section 7. “Control Charts in CDM project activities” of the respective Manuals. The procedures take into account the comments found of CAR-1.	☒ Corrected without raising significant concern on the reliability of measured data. And the guidance of QAL3 including trouble shooting has been developed as mentioned in the response and the result was submitted in xls file.
<u>Clarification Request #7.</u> Shewhart chart is used as QAL3, using zero/span check results on N2O analysers however there are to be further elaborated. As the purpose of using Shewhart chart is to find a sign of abnormality on the measuring system. Usually there should be criteria/definition of abnormality on measured data to initiate investigation before having actual malfunctioning, e.g. out of UCL/LCL, consecutive increase/decrease, too narrow distribution, one sided distribution, etc. (although such abnormality does not immediately mean actual abnormality	C.5.	CDM Manuals at Secunda plant and Sasolburg plant respectively include instructions regarding how Shewhart Charts must be used. Those instructions are in section 7. “Control Charts in CDM project activities” of the respective Manuals. The procedures take into account the comments found of FAR-3.	☒ The concern has been sufficiently mitigated with the guidance as mentioned above.

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on the measuring system.) 2) In case of abnormality found, such incidents/reasons should be logged on the chart to make the tool more useful as one of typical practice 3) Such statistical control chart like Shewhart could be useful to maintain accuracy on flow volume measurement too, if flow volume has normal distribution. Not with periodic test, but just with measured values. Because, in case significant incident takes place on the flow volume measurement systems, distribution can be changed. Such study can periodically be done with recorded data easily, and it could find a problem on transmitting system.		It should be noted that stack flow cannot be expected to have a normal distribution since production is not constant (flow should be proportional to production at normal conditions). Furthermore, as per the manufacturer recommendations, it is not necessary to perform frequent re-calibrations or accuracy check on this type of instruments (the accuracy shift does not indicate such need).	
<u>Clarification Request #8.</u> Data processing protocol including primary filtering on raw data and secondary filtering/calculation on Excel data, i.e. from start to end to determine ERs, are to be comprehensively checked their soundness or adequacy because of following concerns or problems. At Secunda, measured raw data are filtered with data min. limit e.g. 0 value from N2O analyser, 400°C for gauze temperature to be eliminated. But its adequacy might better be checked from various point of view (This is	C.6.	All the raw data were included in the spreadsheet as per TUV recommendations. At Sasolburg plant, the following criterion is used to define plant status; When oxidation temperature (the average of data of the three thermocouples) is below 650°C the plant is off-line, when the average is above that number the plant is on line. At Secunda plant, the gauze temperature given by the instrument TI_0121 is used to define plant status. When temperature is above 650°C the plant is considered on-line and when that temperature is below 650°C the plant is considered off line. It was found that oxidation temperature level (as	☒ Clarified. In addition to few corrections on data filtering protocol on xls files, CDM_EB's answer to the clarification request about interpretation of AM0034, AM_CLA_0063 helped to simplify this discus-

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not to require unconditional data archiving) At both plants, OH_{project}, the operating hours is to be determined with signals of both ammonia and air flow in accordance with the page 42 of the PDD. However, as stated in C.1., significant part of the baseline campaign operation at Sasolburg was still out of the permitted operating range “in the calculation” because of low temperature data from “cold start”. Therefore, the filtering for the purpose between to verify operating conditions and to determine operating hours would better be separated. At Sasolburg, 3 temperature sensors are installed to monitor the reactor temperature. And it was explained that the mean value was used to control. On the other hand, the average seems to be used for the comparison of operating conditions. Please check if this is true or not.		defined) correlates closer with actual plants status (producing vs stand-by or idle) than reactors flows. Determination of operating hours is completely independent of data analysis and filtration by normal operating condition procedure. Since gauze (oxidation) temperature is a critical parameter from the operational and safety standpoint, it is normal to have redundant measurements and use the median for process control purposes. For comparison vs normal operating conditions, the average of all 3 measurement was used.	sion so that a PP can remove just VSGBC and NCSGBC data for hours when the conditions are out of the permitted operating ranges, whether the status precisely is “operating” or not, for baseline calculation.
<u>Clarification Request #9.</u> In the page 9 of MR for Sasolburg plant, 7,671 kg NH₃/hr as the AFR_{BC}, the Baseline Anmonia Flow Rate is stated however it is bigger than 6,771 , the AFR_{max} stated in the PDD. This may be a mistake of 6,671 but please clarify this anyway.	C.7.	It has been a mistake on the units of the number stated in the MR, that number is 7,671 Nm³/h. The MR was modified and sent to TUV	☒ Corrected to 5,819 kg NH₃/hour as the average
<u>Corrective Action Request #2.</u>	C.7.	Both during the original baseline emission factor recal-	☒

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In the page 15 of MR, BE_{BC} for the 1st project campaign at Sasolburg plant is recalculated because it was shorter than the normal campaign length. However only NAP_{BC} is changed to smaller value without changing $NCSG_{BC}$ value. The methodology states about Shorter Project Campaign in the page 10 -11 as “If $CL_n < CL_{normal}$, recalculate EF_{BL} by eliminating those N_2O values that were obtained during the production of tones of nitric acid beyond the CL_n (i.e. the last tones produced) from the calculation of EF_n.” Therefore recalculated $NCSG_{BC}$ value is to be applied instead.		culuation as well as the final versions, we had recalculated not only the NAP_{BC} but the $NCSG_{BC}$ and VSG_{BC} also.	Corrected. $NCSG_{BC}$ has been corrected to comply with shorter project campaign length. Simultaneously other values like NAP_{BC} and VSG_{BC} as well as overall result, i.e. EF_{BC} has been recalculated in the same way.
<u>Corrective Action Request #3.</u> For several parameters, single values are stated in MR, e.g. “4.0 bar” for the Baseline Oxidation Pressure, “OP_{BC}” however unknown to identify the meaning of these values as the result is a mass data which have distribution. This may be average values, but please clarify.	C.7.	Values given in the MR for: stack pressure, stack temperature, oxidation temperature, oxidation pressure, ammonia flow and ammonia to air ratio are campaign averages based on the hourly data series.	☒ Clearly identified as mentioned in the response.
<u>Clarification Request #10.</u> There are some tasks demanding special knowledge like zero/span check, Shewhart chart. However, as weakness was found on such tasks e.g. in accordance with CAR#1 and FAR#3, applicable procedures to identify training needs seemed not sufficiently to	C.9.	Chapters 6 and 7. “Instrumentation for the CDM project” and “Control charts in CDM project activities” of the CDM manuals contains specific procedures for calibration and control charts preparation. Inside folder called “General” which is part of the CDM Manual there is a special section (GENCDM0004- Training awareness and Competence) that sets general guidelines and procedures to be implemented for train-	☒ The concern has sufficiently been mitigated with guidance and procedures developed as mentioned in the response.

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work. Please check.		ing personnel. The document mentioned above has been provided to TUV. Actions are underway to assure implementation/deployment of any new or modified procedure (generated as consequence of verification audit).	
<u>Clarification Request #11.</u> With regard to trouble shooting procedures, previous problem on N2O Analyser found in last December has deteriorated credibility of previously measured data significantly. Correction on analyser as well as introduction of weekly zero/span check were made immediately however credibility of data measured before finding a problem may have not yet been fully evaluated. The same problem can happen at calibration and immediate investigation both on cause and credibility of previously measured data should be done as well as consideration of increasing calibration frequency, in general. And quick investigation may make subcontractor's or manufacture's involvement easier. As a failure of monitoring system can immediately result in with losing credibility of measured data with regard to CDM activities of which consequence can be very different from one for production activities. From this	C.11.	The CDM Manual includes and explanation on how weekly zero/ span checks are developed and how the information obtained from those tests shall be interpreted. The information is included in section 6 and 7 . “Instrumentation for the CDM project” and “Control charts in CDM project activities”. The specific situation given at Secunda (failure to calibrate at specified intervals) was due to procurement problem with the calibration gas, not as result of absence of procedure or lack of training of responsible personnel.	☒ The concern has been more or less mitigated with procedures developed as mentioned in the response. As this is not immediate issue about credibility on data and calculation, as this is not about immediate requirements of the methodology, a verifier will see the result at a next opportunity as one of usual subjects.

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point of view, CDM specific trouble shooting procedures would be more clearly established and documented for various kind of possible but specific incidents, e.g. failure at calibration, Zero/Span check, malfunction, abnormality on Shewhart chart, etc.			
<u>Clarification Request #12.</u> In PDD, “cross check” is talked about various parameters in PDD, e.g. OH_{BC} , NAP , AFR_{BC} , CL . However the result of such effort was not really visible. Because, even if those parameters interact each other, values do not precisely coincide and just a list of values does not usually imply specific information. If appropriate, graphical tool would be considered to make such work easier.	D.3.	At both plants (and as explained on the pdd) both the stack gas flow and production are double check on a daily basis (using daily average data when applies). Stack gas flow is estimated by a Nitrogen mass balance which use as variables the ammonia feed to the process plus the oxygen concentration at the stack (mathematical derivation of the mass balance formula were provided to the Verification team). Production is measured directly using mass flow meter and is cross checked with mass balances on a daily basis as well, which use weight of shipments, and tank levels as incoming data. Actually for accounting/financial purposes the mass balance production result is what is used by Sasolburg since its accuracy is considered higher.	☒ Clarified with specific ways as stated in the response.
<u>Clarification Request #13.</u> With regard to EF_{reg} monitoring, the current consequence has no defect. However which information are to be monitored and recorded to demonstrate monitoring activities would be identified more clearly.	F.3.	Evidences of the communications between Sasol and the Environmental National Authorities have been sent to TUV. Regarding to future monitoring of EF_{reg} , CDM Manuals in its chapter 2 “Monitoring of Legislation referring to N_2O and NO_x emission limits” explain how the changes on the legislations will be monitored	☒ Sufficiently defined as mentioned in the response.
<u>Corrective Action Request #4.</u> The methodology requires data archiving	G.5.	Both plants will create hard copy backups based on daily averages. Files will be available for future verification audits	☒ Corrected as defined in

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both in electronic and paper formats however how data is archived in paper format has not yet been identified.		Chapter 5 of the CDM Manuals “Data management and storage” will be modified in order to describe procedure for hard data archiving.	the response.
<u>Clarification Request #14.</u> The methodology requires data archiving mostly for 2 years or for entire crediting period which can be 21 years. Although this request is very CDM specific and different from ordinary QA or accounting procedures, such requirements are not incorporated in QMS documents.	G.5.	The CDM Manuals include how data is archived in its section 5-Data management and storage. Both Plants will make daily averages of all data and keeps it in hard copy as back up. This information will kept at the plant for the entire crediting period.	☒ The rule has been stipulated in “Safeguarding of data & long term data storage.doc”
<u>Corrective Action Request #5.</u> In MP, 2 PPs are stated compared to PDD in which only 1 PP is stated. I.e. Revised LoA and revised MoC have been submitted to UNFCCC. To finish verification, this inconsistency shall be resolved.	G.6.	We received a communication from UNFCCC secretariat confirming the inclusion of MGM as PP. That document was submitted to DNV during the verification visit. Revised LoA and the latest version of the MoC (both of them submitted to UNFCCC) have been sent to TUV.	☒ Provided.

Table 3 Unresolved Corrective Action and Clarification Requests (in case of denials)

Clarifications and / or corrective action requests by validation team	Id. of CAR/CR	Explanation of Conclusion for Denial
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Annex 2: Verification Protocol

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Table 1: Data Management System/Controls

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

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

Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
1. Defined organisational structure, responsibilities and competencies		
1.1. Position and roles <i>Position and role of each person in the GHG data management process is clearly defined and implemented, from raw data generation to submission of the final data. Accountability of senior management must also be demonstrated.</i>	Full	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. 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 Man-

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
		agement 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. Though the lists of key monitoring equipment for CDM activities are prepared to ensure the conformance to the planning, calibration is carried out and reported in a part of overall QMS certified with ISO 9001.
1.2. Responsibilities <i>Specific monitoring and reporting tasks and responsibilities are included in job descriptions or special instructions for employees.</i>	Full	As an external partner, MGM is supposed to be a “Project Developer” which is stated in above procedures, and is to receive above spread sheets from Sasol to calculate and finally issue a monitoring report. And the senior management including the General Manager oversees overall operations. Though Management Review is not separately done for CDM activities, the minutes of management review clearly referred issues of this project.
1.3. Competencies needed <i>Competencies needed for each aspect of the GHG determination process are analysed. Personnel competencies are assessed and training programme implemented as required.</i>	Full	All competences and capabilities are covered by the persons working directly on the CDM activities with relationship to the CDM activity. There was a weakness found on application of the control chart, i.e. QAL3 on tail gas measurement because of the new experience, however the concern has been minimized after developing specific procedures.
2. Conformance with monitoring plan		

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
2.1. Reporting procedures <i>Reporting procedures should reflect the monitoring plan content. Where deviations from the monitoring plan occur, the impact of this on the data is estimated and the reasons justified.</i>	Full	The data management system and all reporting procedures reflect the monitoring plan completely. (see: initial verification protocol attached as Annex 3 of this verification report)
2.2. Necessary Changes <i>Necessary changes to the monitoring plan are identified and changes are integrated in local procedures as necessary.</i>	Full	No necessary changes were identified.
3. Application of GHG determination methods		
3.1. Methods used <i>There are documented description of the methods used to determine GHG emissions and justification for the chosen methods. If applicable, procedures for capturing emissions from non-routine or exceptional events are in place and implemented.</i>	Partial	The auditor has finally considered the methods used as compliant with the monitoring plan stated in PDD as well as the applied methodology although there was an exceptional and a crucial discussion about the way of calculation to determine the baseline at Secunda. Because the N2O concentration measurement was found to be unstable few months after the start of the baseline campaign. As mentioned in the former section in this report, the auditor has accepted the way how to comply with such exceptional incident, as a conservative way to cope with this trouble within the right interpretation of the methodology. All calculations including filtering “out of range” data were provided to the auditor transparently with Excel files, and are considered to be complete and to have reasonable reliability.
3.2. Information/process flow <i>An information/process flow diagram, describing the entire process from raw data to reported totals is developed.</i>	Full	The data acquisition system automatically logs emission data and process data. Then these data are converted to spread sheets to be checked by the monitoring engineers including cross checking referred in PDD to exclude implausible data.

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
		MGM creates the final spread sheets to filter and to calculate the baseline emission or the project emission. These data are sufficiently traceable as they accompany sufficient identification like time, day, parameters, etc. There is no external sourced data affecting the determination of the baseline and the project emission, except some conditional parameters like gauze composition, UNC determined with the result of QAL2.
3.3. Data transfer <i>Where data is transferred between or within systems/spreadsheets, the method of transfer (automatic/manual) is highlighted - automatic links/updates are implemented where possible. All assumptions and the references to original data sources are documented.</i>	Full	Besides the information flow indicated above no further data transfer is required.
3.4. Data trails <i>Requirements for documented data trails are defined and implemented and all documentation are physically available.</i>	Full	At the both plants, the overall QMS certified with ISO 9001 covers CDM activities. In addition to existing procedures, several additional procedures have been developed specifically for CDM activities.

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
4. Identification and maintenance of key process parameters		
4.1. Identification of key parameters <i>The key physical process parameters that are critical for the determination of GHG emissions (e.g. meters, sampling methods) are identified.</i>	Full	The most critical parameters for the determination of GHG emissions are N2O measurement in the tail gas as the methodology require to use the guidance document EN14181, as well as the amount of nitric acid which could make the same effect on the calculation. Such measuring equipments including other important parameters are identified in the special list named "Critical instrumentation equipment – CDM Project Activities list" with their individual tag numbers and test frequencies, and of which applicable procedures are specifically stipulated in their QMS documents additionally developed for CDM activities..
4.2. Calibration/maintenance <i>Appropriate calibration/maintenance requirements are determined.</i>	Full	Calibration/maintenance was done to comply with the specific monitoring plan established for CDM as well as in a part of QMS. And all auditors' requests to inquire applicable calibration records were complied successfully at the on-site audit. As a result, there was no deficiency found in previous calibration records although the activities have been elaborated with additional documents developed specially for CDM activities as a result of IV.

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
5. GHG Calculations		
5.1. Use of estimates and default data <i>Where estimates or default data are used, these are validated and periodically evaluated to ensure their ongoing appropriateness and accuracy, particularly following changes to circumstances, equipment etc. The validation and periodic evaluation of this is documented.</i>	Full	As mentioned in 3.1, N2O analyser had become unstable at the beginning of the baseline campaign at Secunda, and IPCC default 4.5 kg N2O/tHNO3 is applied to supersede unreliable measured data. In addition, as N2O concentration is thought to be lower than the IPCC default for the very beginning of the baseline campaign, the lowest assumption measured in the first week is applied to such period instead of IPCC default, "as the last measured value". The auditor has accepted these applications as well conservative interpretation of the monitoring plan in the registered PDD as well as the applied methodology.
5.2. Guidance on checks and reviews <i>Guidance is provided on when, where and how checks and reviews are to be carried out, and what evidence needs to be documented. This includes spot checks by a second person not performing the calculations over manual data transfers, changes in assumptions and the overall reliability of the calculation processes.</i>	Full	Sasol has developed various documented procedures specifically for CDM activities listed in "CDM Project Document Index" which are as aforementioned an integral part of the certified quality management system (ISO 9001). The overall management system covers the issue of management review for all activities as required for system certification as the scope of the QMS includes nitric acid production.
5.3. Internal validation and verification <i>Internal verifications include the GHG data management systems, to ensure consistent application of calculation methods.</i> <i>Data reported from internal departments should be validated visibly (by signature or electronically) by an employee who is able to assess the accuracy and completeness of the data. Supporting information on the data limitations, problems should also be included in the data trail.</i>	Full	Internal validation and verification in a sense of daily checks are done in accordance with tasks and responsibilities defined in several QMS procedures. In addition, cross checks are done with specific procedures developed as a part of their QMS structure.

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
5.4. Data protection measures <i>Data protection measures for databases/spreadsheets should be in place (access restrictions and editor rights).</i>	Full	In addition to some physical access control mentioned below as IT system, their hierarchical roles and responsibilities defined in their QMS documents like “People involved in the CDM project activities at the plant” at Secunda and “Description of personnel involved in the CDM Project activities” at Sasolburg is helping the system.
5.5. IT systems <i>IT systems used for GHG monitoring and reporting should be tested and documented.</i>	Full	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.

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Expectations for GHG data management system/controls	Score	Verifiers Comments (including <i>Forward Action Requests</i>)
		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.

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Table 2: GHG calculation procedures and management control testing

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
Potential reporting risks based on an assessment of the emission estimation procedures can be expected to occur in the following fields of action: 1. raw data collection 2. calculation methods Key source data applicable to the project assessed are hereby: • Metering records • Laboratory/analytical data • Accounting records. Appropriate calibration and maintenance of equipment resulting in a high accuracy of data supplied should be in place. It is hereby needed to focus on those risks that impact the accuracy, completeness and consistency of the reported data. Risks are weaknesses in the GHG calculation systems and may include: ➤ manual transfer of data/manual calculations	Regarding the potential reporting risks identified in the left column the following mitigation measures have been observed during the document review and the on-site mission. Calculation methods: The use of excel files is requiring a detailed check of correct transfer of algorithms into this format and a carefully treatment of all “copy and paste” actions to avoid any overwriting of cells. Detailed reviews of any excel spreadsheet of Sasol/MGM’s Workbooks for both baseline campaigns and project campaigns, and for both Sasolburg and Secunda. Any key parameters had been focused in special awareness. Any automatic raw data entry and a proper use of correct default data had been proved. Calibration and Maintenance: Spot checks have been made in order to get proofs for the realization of calibration measures	No significant residual risks. As this is the First Verification combined with Initial Verification, broad issues have been carefully checked. And thus, the audit team is confident about the result. Just in general, a new problem or weakness can be found at the next period as there are several measuring equipment of which types were quite new to Sasol. Thus, their activities especially of maintenance / calibration need to keep being elaborated at any occasion when they find such a weakness, e.g. about frequency or criteria of calibration, tasks in shutdown. Simultaneously procedures should be simplified after having good result and sufficient experiences, within the plan stated in PDD.

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Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
➤ position of metering equipment ➤ unclear origins of data ➤ accuracy due to technological limitations	as required. Accuracy Spot checks have been made in order to find out level of accuracy. All installed measuring devices are on a high level standard. There are no risks of missing information on data accuracy.	

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

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including <i>Forward Action Requests</i>)
No significant residual risks	-	-

Table 4: Compilation of open issues

Corrective and Forward Action Requests by audit team	Summary of project owner response	Audit team conclusion
<u>Please see “Annex 1: Initial Verification Protocol”</u> As this 1st periodic verification was combined with the initial verification, all findings including their clarifications are stated in the initial verification protocol.		No open issues as a result.

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Annex 3: Information Reference List

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Reference No.	Document or Type of Information																																							
1	Final Project Design Document for CDM project “Sasol Nitrous Oxide Abatement Project”, South Africa dated January 15, 2008 as available at cdm.unfccc.int																																							
2	Validation Report No. 2007-0195 Revision No. 01 for CDM project “Sasol Nitrous Oxide Abatement Project”, South Africa issued by Det Norske Veritas, dated February 7 , 2007 as available at cdm.unfccc.int																																							
3	CDM Monitoring Report No. 0961, dated January 8th , 2008 of “Sasol Nitrous Oxide Abatement Project”, South Africa UNFCCC covering the period May 25th, 2008 until October 1st, 2008																																							
	On-site and on-line interviews conducted on January 15, 2008 by auditing team of TÜV SÜD Verification team: <table><tr><td>Mr Konrad Tausche</td><td>Project Manager</td><td>TÜV SÜD, Munich</td></tr><tr><td>Mr Yutaka Yoshida</td><td>Lead Auditor</td><td>TÜV SÜD, Japan</td></tr><tr><td>Mr Cyprian Fusi</td><td>GHG Auditor Trainee</td><td>TÜV SÜD, Munich</td></tr></table> Interviewed persons: <table><tr><td>Mr Gerrit Fourie</td><td>Control System Engineer</td><td>Sasol Nitro, Sasolburg South Africa</td></tr><tr><td>Mr Johannes Louw</td><td>General Manager</td><td>Sasol Nitro, Sasolburg South Africa</td></tr><tr><td>Mrs Maria Ines Hidalgo</td><td>Chemical Team Director,</td><td>MGM, Argentina</td></tr><tr><td>Mr Fred Van Heerden</td><td>Manager, Control Systems</td><td>Sasol Nitro, Sasolburg South Africa</td></tr><tr><td>Mrs Jaco Van Straaten</td><td>Production Manager</td><td>Sasol Nitro, Sasolburg South Africa</td></tr><tr><td>Mr Puter Matthiser</td><td>Process safety, PSM Manager</td><td>Sasol Nitro, Sasolburg South Africa</td></tr><tr><td>Mr. Wynand Louw</td><td>Planner</td><td>Sasol Nitro, Sasolburg South Africa</td></tr><tr><td>Mr. Perus Hanekom</td><td>OPS Manager</td><td>Sasol Nitro, Sasolburg, South Africa</td></tr><tr><td>Mr. S. Evenwel</td><td>Production Manager</td><td>Sasol Nitro, Secunda, South Africa</td></tr><tr><td>Mr. H. Harinath</td><td>Chemical Engineer</td><td>Sasol Nitro, Secunda, South Africa</td></tr></table>	Mr Konrad Tausche	Project Manager	TÜV SÜD, Munich	Mr Yutaka Yoshida	Lead Auditor	TÜV SÜD, Japan	Mr Cyprian Fusi	GHG Auditor Trainee	TÜV SÜD, Munich	Mr Gerrit Fourie	Control System Engineer	Sasol Nitro, Sasolburg South Africa	Mr Johannes Louw	General Manager	Sasol Nitro, Sasolburg South Africa	Mrs Maria Ines Hidalgo	Chemical Team Director,	MGM, Argentina	Mr Fred Van Heerden	Manager, Control Systems	Sasol Nitro, Sasolburg South Africa	Mrs Jaco Van Straaten	Production Manager	Sasol Nitro, Sasolburg South Africa	Mr Puter Matthiser	Process safety, PSM Manager	Sasol Nitro, Sasolburg South Africa	Mr. Wynand Louw	Planner	Sasol Nitro, Sasolburg South Africa	Mr. Perus Hanekom	OPS Manager	Sasol Nitro, Sasolburg, South Africa	Mr. S. Evenwel	Production Manager	Sasol Nitro, Secunda, South Africa	Mr. H. Harinath	Chemical Engineer	Sasol Nitro, Secunda, South Africa
Mr Konrad Tausche	Project Manager	TÜV SÜD, Munich																																						
Mr Yutaka Yoshida	Lead Auditor	TÜV SÜD, Japan																																						
Mr Cyprian Fusi	GHG Auditor Trainee	TÜV SÜD, Munich																																						
Mr Gerrit Fourie	Control System Engineer	Sasol Nitro, Sasolburg South Africa																																						
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Mr. S. Evenwel	Production Manager	Sasol Nitro, Secunda, South Africa																																						
Mr. H. Harinath	Chemical Engineer	Sasol Nitro, Secunda, South Africa																																						
4	UNFCCC homepage http://www.unfccc.int including the CDM section cdm.unfccc.int																																							
5	Approved baseline and monitoring methodology AM0034, Version 2																																							
6	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																																							

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Reference No.	Document or Type of Information
	designed guaranteed minimum capacity and 556.8 ton 100% per day as demonstrated capacity in November 1973
7	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%HNO ₃ /d
8	Registration in terms of the Atmospheric Pollution Prevention Act, 1645 (ACT 45 of 1645) dated on 2004/12/28 from the department of Environmental Affairs and Tourism, Republic of South Africa, stating well maintained prevention or reduction of escaping into atmosphere of noxious or offensive gases at Sasolburg.
9	Mail dated 14 th February 2008 from Infrachem SHERQ, Environmental Services giving testimony in relation to legislative compliance with NO _x regulation
10	SGS’s QAL2 Report, “Validation of N ₂ O Measurements Sasol Nitro Plant in Sasolburg”, February 2007 as period investigation
11	SGS’s QAL2 Report, “Validation of N ₂ O Measurements Sasol Nitro Plant in Secunda”, February 2007 as period investigation
12	ABB’s Three Test Certificates issued at new installation of the gas analyzer “Atvance Optima” at Secunda
13	ABB’s Calibration Certificate done on 13 December 2006 at Secunda after finding significant drift on N ₂ O concentration measurement, indicating 20ppm deviation from “0 gas” check, and 1,326 ppm with the “span gas” at 1,045 ppm
14	QAL3 Shewhart Chart being maintained with the results of periodic zero/span checks at Sasolburg, which was to be corrected to add UCL/LCL
15	“Shewart Nitro Stats 2007 Sasolburg.xls” as the corrected result
16	QAL3 Shewhart Chart being maintained with the results of periodic zero/span checks at Secunda
17	Certificate label on the cylinder of reference gas installed and being used at Secunda for Span check issued by AIR LIQUIDE, required at 1,000 ppm and ppm 30 as a tolerance,
18	Certificate label on the vacant cylinder of reference gas stored at Secunda for Span check was “Required: 1,000 ppm, Analysed 1167 ppm, Tolerance:+/-3%
19	Certificate label on the cylinder of reference gas installed and being used at Sasolburg for Span check was “Required:2,500 ppm, Analysed:2547ppm, Tolerance:+/-3%, filled on 14/08/2007, Expiry:14/08/2008”. The result of the demonstration with that span gas at the on-site visit was 2577 ppm.
20	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
21	Shut Down Maintenance Records at Secunda for FI0116 Varify acid flow meter, done on 22/02/06, 16/08/06, 20/03/07, 18/01/08
22	Shut Down Maintenance Records at Secunda for “Instr. Check” temperature and pressure on “BO101 LA MONT BOILER”, i.e.

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Reference No.	Document or Type of Information
	Ammonia Oxidization Reactor, done on 26/02/06, 26/08/06, 04/01/07, 18/01/2008
23	Shut Down Maintenance Records at Secunda for FI0135 Verify flow meter readin (flow at stack), done on 22/02/06, 10/03/07, 19/01/08
24	Re-Calibration record of ammonia and air flow meters at Sasolburg dated on 31/05/06, recorded on the sheet of “Dieterich Standard Flow Calculation”
25	Sasolburg “Instrument Calibration NAP Plant” dated on 12 June 2007 and 29 June 2007, as a list indicating individual calibration status including NH3 flow, air flow, mixed gas temperature (gauze temperature), NH3 pressure
26	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
27	Specification of temperature transmitter iTEMP PCP TMT 181 indicating “Long term stability” at $\leq 0.1K/Year$ or $\leq 0.05\%/Year$
28	Specification of Rosemount 3051 Pressure Transmitter indicating “Safety accuracy” at 0.065%
29	“Precious Metal Contents” provided by Heraeus, dated Nov 22, 2006. for both plant use PTCPlus
30	The letter from Heraeus titled “Re: Indicative costing for 16 th FTCplus campaign” dated 10 January, 2008 states “indicative costing for the campaign starting about 2 nd October 2007” in the table. 5 th -8 th as full FTC campaigns, 9 th – 14 th as FTCPlus campaigns and 15 th – 16 th as projected campaigns for Sasolburg plant
31	The letter from Heraeus titled “Re: 14 th campaign -210 days – fixed rate” indicates actual history for 4 th - (12 th as the baseline) for Secunda plant
32	Uhde's Technical Document dated on 02.09.83
33	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.
34	International Fertilizer Society “Proceedings 50” ISBN 0 85310 1760, as the external literature indicating 1.5-6 BAR as a normal range in general for medium pressure type
33	RE:Notes on 1973 design design and test run data, Sasol HNO3 plant at Sasolburg, South Africa, pages stating 4.06 bar gauge as the design pressure at burner, 880 as reactor temperature, etc. (without stating “ranges”)
34	Screen Shots on 1/17/2008, including Data Filtering Low/Upper Limits on the data logging system at Secunda, various measured

Final Report 2008-06-20	Periodic Verification of the CDM Project: “Sasol Nitrous Oxide Abatement Project”, South Africa Information Reference List	Page 5 of 5	 Industrie Service
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Reference No.	Document or Type of Information
	values including N ₂ O concentration, hourly averages, a graph of NO gas, Alarm screen, “Network Layout” as a configuration of the data logging system
35	CDM Monitoring Report N°1-Sasol-25 April 2008
36	Sasolburg Hand writing logs of operating parameters, “NITRIC ACID LOGSHEET 1”, “1B”, “2B”, dated on 08/10/2006, 2003-01-17, 28/10/2001
37	Calculation and graph of conversion efficiency from NH ₃ to NA, to prove unreliability of historic data, i.e. frequently over 100%
38	Mass Flowmeter Calibration Certificate from Micro Motion, Inc. (Process Time 2004.09.03 13:39:03)
39	Calibration Certificate from Alpret Control Specialists (dated 2004.09.21)
40	Two Scheduled Maintenances: Carbon Credit Calibration (start date 01.06.2006 and 01.06.2006)
41	Carbon Credits Instrumentation Schedules (dated 30.11.05)
42	Technical Information: Temperature head transmitter iTEMP PCP TMT 181 from Endress and Hauser
43	“Sasolburg Baseline emission Factor recalculation 10 January 2008” (excel file)
44	“Sasolburg VERs calculations 10 January 2008” (excel file)
45	“Sasolburg First Project Campaign 10 January 2008” (excel file)
46	Sasolburg First Project Campaign 25 March 08.xls , Secunda First Project Campaign 24 April 08.xls
47	“Sasolburg Baseline Emission Factor Recalculation 17 April 08.xls”
48	“Secunda Baseline Emission Factor Calculation 15 April 08- using the whole line.xls” (not applied)
49	“Secunda Baseline Emission Factor Calculation 15 April 08.xls” (applied)
50	CDM Monitoring Report No. 0961, dated 25 th April 2008 of “Sasol Nitrous Oxide Abatement Project”, South Africa UNFCCC covering the period May 25 th , 2008 until October 1 st , 2008