VALIDATION OPINION – CREDITING PERIOD RENEWAL

SASOL NITROUS OXIDE ABATEMENT PROJECT

(UNFCCC Registration Ref. No. 0961)

REPORT NO. 2013-1626

REVISION NO. 01

DET NORSKE VERITAS

VALIDATION OPINION – CREDITING PERIOD RENEWAL

Date of first issue: 2013-11-28	ConCert Project No.: PRJC-494506-2013-CCS-NOR
Approved by: Michael Lehmann	Organisational unit: Accredited Climate Change Services
Client: MGM Carbon Portfolio S.a.r.l.	Client ref.: Pablo Fernand

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Summary:

Project Name: Sasol Nitrous Oxide Abatement Project
Registration Ref. No.: 0961)
Country: South Africa
Methodology: ACM0019 **Version:** 02.0
GHG reducing Measure/Technology: The installation of a secondary catalyst to abate N_2O inside the reactor once it is formed.
ER estimate: 648 162 tCO_2e per year (average)
Size

☒ Large Scale ☐ Small Scale

Validation Phases:

☒ Desk Review
☒ Follow up interviews
☒ Resolution of outstanding issues

Validation Status

☐ Corrective Actions Requested ☐ Clarifications Requested
☒ Full Approval and request for renewal ☐ Rejected

In summary, it is DNV's opinion that the project activity "Sasol Nitrous Oxide Abatement Project" in South Africa, as described in the PDD, version 8 of 5 October 2014, meets all relevant UNFCCC requirements for the renewal of the crediting period. Hence DNV requests the renewal of the crediting period of the project.

Report No.: 2013-1626	Subject Group: Environment
Report title: Sasol Nitrous Oxide Abatement Project	
Work carried out by: Rafi-ud-Din Khawaja, Trine Kopperud	
Work verified by: Ravi Kumar Prabhu	

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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of approval
N_2O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
PS	Clean Development Mechanism Project Standard
tCO_2e	Tonnes of CO_2 equivalents
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation and Verification Standard

1 EXECUTIVE SUMMARY – VALIDATION OPINION

DNV Climate Change Services AS (DNV) has performed an assessment of the request by MGM Carbon Portfolio S.a.r.l. to renew the crediting period of CDM project activity 0961 "Sasol Nitrous Oxide Abatement Project" in South Africa. The assessment was performed in accordance with the Validation and Verification Standard (Version 07.0) and the CDM Project Standard (Version 07.0) and included an assessment of:

(a) An impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant guidance from the Board with regard to renewal of the crediting period at the time of requesting renewal of crediting period;

(b) The correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the validity of the original baseline scenario and the update to the baseline through an assessment. The project correctly applies the baseline and monitoring methodology ACM0019, version 02.0 "N2O abatement from nitric acid production".

The total emission reductions from the project are estimated to be on the average 648 162 tCO_2e per year over the 2nd renewable crediting period. The emission reduction forecast has been checked, and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The monitoring plan provides for the monitoring of the project's emission reductions. The monitoring arrangements described in the monitoring plan are feasible within the project design, and it is DNV's opinion that the project participants are able to implement the monitoring plan.

In summary, it is DNV's opinion that the CDM project activity 0961 "Sasol Nitrous Oxide Abatement Project" in South Africa meets all relevant UNFCCC requirements for the renewal of the crediting period. Hence DNV requests the renewal of the crediting period of the project.

Oslo, 2014-11-10

Rafi-ud-Din Khawaja
Validator

Michael Lehmann
Director of Services and Technologies
DNV Climate Change Services AS

2 INTRODUCTION

DNV Climate Change Services AS (DNV) was commissioned by MGM Carbon Portfolio S.a.r.l. to perform an assessment of the request to renew the crediting period of CDM project activity 0961 "Sasol Nitrous Oxide Abatement Project" in South Africa.

The assessment was performed in accordance with the Validation and Verification Standard (Version 07.0) and the CDM Project Standard (Version 07.0) and included an assessment of:

(a) An impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant guidance from the Board with regard to renewal of the crediting period at the time of requesting renewal of crediting period;

(b) The correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period.

3 METHODOLOGY

The validation consisted of the following three phases:

I document review

II follow-up actions (e.g. on-site visit and telephone or email interviews)

III the closing out of validation findings and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Document Review

The following tables list the documentation that was reviewed during the validation.

3.1.1 Documentation provided by the project participants

/1/ Author: *CDM-PDD for project activity "Sasol Nitrous Oxide Abatement Project" in South Africa*, Version 06 dated 18 November 2013 and final version 8 dated 5 October 2014

/2/ MGM International Ltda.: *registered PDD for project activity under the first crediting period "Sasol Nitrous Oxide Abatement Project" in South Africa*, Version 5, Date 31 January 2007

/3/ MGM International Ltda.: Emission Reduction Estimation Spreadsheet for the *for project activity "Sasol Nitrous Oxide Abatement Project" in South Africa* dated 22 April 2014

/4/ Friedrich Uhde GMBH: Sasolburg Production specification document

/5/ Uhde GMBH: Secunda Production specification documents

/6/ SGS Environmental Services: QAL 2 report for Sasol Nitro nitric acid plant located in Sasolburg 12 – 14 August 2013

/7/ SGS Environmental Services: QAL 2 report for Sasol Nitro nitric acid plant located in Secunda 15 – 17 August 2013

3.1.2 Methodologies, tools and other guidance by the CDM Executive Board

/8/ CDM Executive Board: *Clean Development Mechanism Validation and Verification Standard,* version 07.0

/9/ CDM Executive Board: *Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period*. Version 03.0.1

/10/ CDM Executive Board: *Clean Development Mechanism Project Standard,* version 07.0

/11/ CDM Executive Board: *Clean Development Mechanism Project Cycle Procedure,* version 07.0
Note: *As per this procedure, the Project Participants sent a notification to UNFCCC Secretariat by e-mail on 19 November 2013 informing the interest from Project Participants to renew the crediting period and appointing DNV as the DOE.*

/12/ CDM Executive Board: *Baseline and monitoring methodology ACM0019*, Version 02.0

/13/ CDM Executive Board: *Tool to determine the mass flow of a greenhouse gas in a gaseous stream*, Version 02.0.0

/14/ CDM Executive Board: *Tool to calculate project or leakage CO2 emissions from fossil fuel combustion*, Version 02

3.1.3 Documents used by DNV to validate / cross-check the information provided by the project participants

/15/ DNV: *Validation Report "Sasol Nitrous Oxide Abatement Project" in South Africa*, Version 01, Date 07 February 2007.

/16/ TUV SUD: *Verification reports for "Sasol Nitrous Oxide Abatement Project" in South Africa for the monitoring periods from* 25 May 2007 to 31 July 2011

/17/ Enacted by the Parliament of the Republic of South Africa: National Environmental Management: Air Quality Act 39 of 2004

/18/ Government Notice 248 in Government Gazette 33064 of 31 March 2010, List of Activities and Associated Minimum Emission Standards Identified in terms of section 21 of National Environmental Management: Air Quality Act 39 of 2004.

3.2 Follow-up actions

On 10 December 2013 DNV visited the Sasol Nitro nitric acid plant at Sasolburg and performed interviews with project stakeholders.

	Date / Type of interview	Name / Organization	Topic
/19/	10 December 2013 ☒ On-site ☒ Face-to-face at office ☐ Telephone ☐ E-mail	Johannas Low General Manager Fertilisers Sasol Nitro	• Project implementation; • The impact of circumstances for nitric acid; • Different technologies for nitric acid

			production; • Relevant national and/or sectoral policies for N_2O emission.
/20/	10 December 2013 ☒ On-site ☒ Face-to-face at office ☐ Telephone ☐ E-mail	Paul Venter Sasol Nitro	• Validity of the original baseline or its update; • Update of estimated GHG emission reduction; • Update of the monitoring plan.
/21/	16 October 2013 onwards ☐ On-site ☐ Face-to-face at office ☐ Telephone ☒ E-mail	Pablo Fernandez/ Head of Portfolio Management MERCURIA Energy Trading S.A.	• Validity of the original baseline or its update; • Update of estimated GHG emission reduction; • Update of the monitoring plan.
/22/	16 October 2013 onwards ☐ On-site ☒ Face-to-face at office ☐ Telephone ☐ E-mail	Mr. Lufuno Mukwevho; & Mr. T.M Rambau DNA of South Africa	• Relevant national and/or sectoral policies for N_2O emission. • Carbon Tax in South Africa

3.3 Closing out of validation findings

The objective of this phase of the assessment was to resolve any issues which needed be clarified prior to DNV's positive conclusion on the project's compliance with applicable CDM requirements.

In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a transparent manner the criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

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

The validation protocol consists of three tables. The different columns in these tables are described in the figure below. The completed validation protocol for the project activity "Sasol Nitrous Oxide Abatement Project" in South Africa is enclosed in Appendix A to this report.

Table 1 of the validation protocol documents the findings of the desk review of the project design documentation and follow-up interviews with project stakeholders. Any findings raised in Table 1 are listed in Table 2 of the protocol, and changes to the description of the project design as a result of these findings will be addressed in Table 2. Table 1 thus may not reflect all aspects of the project as described in the final PDD submitted for registration.

A corrective action request (CAR) is raised if one of the following occurs:

(a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;

(b) The applicable CDM requirements have not been met;

(c) There is a risk that emission reductions cannot be monitored or calculated.

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

A forward action request (FAR) is raised during validation to highlight issues related to project implementation that require review during the first verification of the project activity. FARs shall not relate to the CDM requirements for registration.

The validation identified five CARs, five CLs and one FAR. The CARs and CLs were satisfactorily addressed by the project participants by among other revising the PDD (please refer to Table 3 in Appendix A for further details). In addition to the changes made to the PDD as a result of the validation findings, the following changes to the PDD (version 8 dated 5 October 2014) were made compared to the version of the PDD initially provided (version 06 dated 18 November 2013):

- In section A.1, details about the updated baseline which is also aligned with the originally established baseline have been added
- In section B.7.1, EN14181 requirements have been correctly mentioned (i.e. QAL 2 every three years, annual AST for flow, concentration, temperature and pressure parameter along with weekly QAL 3 for concentration parameter)
- In section B.7.3, operational and management structure has been adapted as per the current situation
- In Appendix A, Mr. Pablo Fernandez de Mello e Souza from MGM Carbon Portfolio S.a.r.l. and Mr. Etienne Swanepoel from Sasol Nitro have been added
- The latest CDM-PDD form was applied.

Validation Protocol Table 1: Requirement Checklist				
Checklist question	***Reference***	***Means of verification (MoV)***	***Assessment by DNV***	***Draft and/or Final Conclusion***
The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organised in different sections, following the logic of the CDM-PDD	*Gives reference to documents where the answer to the checklist question or item is found.*	*Means of verification (MoV) are **document review (DR)**, **interview (I)** or any other follow-up actions (e.g., on site visit and telephone or email interviews) and **cross-checking (CC)** with available information relating to projects or technologies similar to the proposed CDM project activity under validation.*	*The discussion on how the conclusion is arrived at and the conclusion on the compliance with the checklist question so far.*	*OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements. A **corrective action request (CAR)** is raised when project participants have made mistakes, the CDM requirements have not been met or there is a risk that emission reductions cannot be monitored or calculated. A **clarification request (CL)** is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. A **forward action request (FAR)** during validation is raised to highlight issues related to project implementation that require review during the first verification of the project activity.*

Validation Protocol Table 2: Resolution of Corrective Action and Clarification Requests			
Corrective action and/ or clarification requests	***Ref. to checklist question in table 2***	***Response by project participants***	***Validation conclusion***
*The **CARs** and/ or **CLs** raised in Table 2 are repeated here.*	*Reference to the checklist question number in Table 2 where the CAR or CL is explained.*	*The responses given by the project participants to address the CARs and/or CLs.*	*The validation team's assessment and final conclusions of the CARs and/or CLs.*

Validation Protocol Table 3: Forward Action Requests		
Forward action request	***Ref. to checklist question in table 2***	***Response by project participants***
The FARs raised in Table 2 are repeated here.	*Reference to the checklist question number in Table 2 where the FAR is explained.*	*Response by project participants on how forward action request will be addressed prior to first verification.*

Figure 1 Validation protocol tables

3.4 Internal quality control

This validation opinion underwent a technical review performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation team

				Type of involvement					
Role	***Last Name***	***First Name***	***Country***	Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	TA 5.1 competence
Team leader (Validator)	Khawaja	Rafi	Norway	✓	✓	✓	✓		
Validator/Expert	Kopperud	Trine	Norway	✓	✓				✓
Technical reviewer	Prabhu	Ravi Kumar	India					✓	✓

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

4 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The final validation findings relate to the project design as documented and described in the PDD, version 8 dated 5 October 2014.

4.1 Validity of selected baseline and monitoring methodology

The project was originally registered under AM0034, version 02. This methodology is not active anymore and has been replaced by ACM0019. Thus the request of renewal of crediting period of the project has been correctly made under the baseline and monitoring methodology ACM0019, version 02.0 "N2O abatement from nitric acid production" /12/ along with Version 02.0.0 of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream /13/.

4.2 Application of selected baseline and monitoring methodology

The assessment of the project's compliance with the applicability criteria of ACM0019 (version 02.0) are documented in detail in section B.2 of Table 2 in the validation protocol in Appendix A to this report.

The chosen baseline methodology is applicable to the project activity as justified below and verified by reviewing the registered PDD of the project /2/, validation report /15/ , the updated PDD version 8 of 5 October 2014 /1/, and verification reports for the monitoring periods during the first crediting period /16/:

- The project activity introduces N_2O abatement measures in a nitric acid plant. The project activity involves the installation of a secondary catalyst to abate N_2O inside the reactor once it is formed.
- The nitric acid plant started commercial operation before the implementation of the CDM project activity. There was no secondary or tertiary abatement technology installed in the respective nitric acid plant. The project is a registered CDM project activity and this has been confirmed during validation of the original project design document. DNV has confirmed this applicability criteria form the review of the validation report.
- Continuous real-time measurements of the N_2O concentration and the total gas volume flow will be carried out in the tail gas stream after the abatement of N_2O emissions throughout the crediting period of the project activity. An Automated Measuring System (AMS) was installed. The PDD refers to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" and its provisions that would be applied, which when fully adopted would ensure this applicability criteria.
- No law or regulation which mandates the complete or partial destruction of N_2O from nitric acid plants exists in the host country where the CDM project activity is implemented. This was further confirmed by interviews with DNA of South Africa /22/.

4.3 Validity of the original baseline or its update

As per the methodology ACM0019, version 02.0 /12/, the baseline scenario is that the N_2O is emitted to the atmosphere with no N_2O abatement measure being implemented. This is actually the updated baseline which is also aligned with the originally established baseline.

As per the VVS /8/, DNV has assessed the validity of the updated baseline through an assessment of the following:

- The impact of any new regulation and or policies and circumstances taking into account relevant guidelines form board.
- The correctness of the application of an approved baseline and monitoring methodology.

DNV confirmed through documents review and interviews that the updated baseline is correct /12/ /22/ as further explained below.

The following Acts/Legislations/Government Notifications pertaining to the complete or partial destruction of N_2O have been reviewed by DNV:

- National Environmental Management: Air Quality Act 39 of 2004 /17/.
- Government Notice of 31 March 2010, List of Activities and Associated Minimum Emission Standards Identified /18/ (developed as per section 21 of National Environmental Management: Air Quality Act 39 of 2004)

National Environmental Management: Air Quality Act 39 of 2004 defines greenhouse gas as *gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation, and includes carbon dioxide, methane and nitrous oxide*.

Para 43 (l) of National Environmental Management: Air Quality Act 39 of 2004 under the ‘‘Contents of provisional atmospheric emission licences and atmospheric emission licences’’ states that a provisional atmospheric emission licence and an atmospheric emission licence must specify the greenhouse gas emission measurement and reporting requirements. Further, the Government Notice of 31 March 2010, ‘‘List of Activities and Associated Minimum Emission Standards Identified’’ section 16 under subcategory 7.2 (Primary Production of Acids) lists only ‘F as HF’, HCL, SO_2, SO_3 and NOx. This was further confirmed by the department of environmental affairs, Republic of South Africa during interviews /22/ the list of activities which results in atmospheric emissions which have or may have significant detrimental effect on the environment, including health social conditions, economic conditions, ecological conditions or cultural heritage was published in the Government Notice 248 in Government Gazette 33064 of 31 March 2010. It was further confirmed by DNA of South Africa that Nitrous Oxide (N_2O) emissions are currently not limited in terms of the notice referred above. DNV is of the opinion that as per these documents N_2O is not currently regulated in South Africa at the nitric acid plants.

DNA was also inquired during interviews /22/ about the potential carbon tax system to be implemented in South Africa. It was stated that currently there are only discussions about the implementation of a Carbon Tax system in South Africa; it is only a regulation proposal. As explained above, it was also confirmed that there was no enforced regulation that would impact the baseline of project activity.

It was further confirmed the Carbon tax proposal ‘‘as it is now’’ will not impact the project baseline. The proposed tax system does not impose any kind of cap or benchmark for N_2O

emissions and does not generate any kind of carbon credit or tax credit. It was also clearly stated that there is neither double counting nor N_2O emissions capping for the project.

Project proponent has further stated that the South African Carbon regulatory development will continuously be monitored and in every verification the new enforced regulations will be assessed to see if they would generate any impact on the baseline scenario of this CDM project (refer to FAR 1 in Table 3 of Appendix A).

4.4 Validity of monitoring plan

The project monitoring plan is in compliance with the monitoring methodology ACM0019 (version 02.0) and applicable tools /13/ /14/.

It is DNV's opinion, that the monitoring arrangements described in the monitoring plan are feasible within the project design and the project participants are able to implement the monitoring plan.

4.4.1 Parameters determined ex-ante

The following parameters are fixed ex-ante as per the requirements of applied methodology and applicable tools /12/ /13/:

Data and parameters	Applied value	Source
OP_{normal} Operating pressure of the ammonia burner	370 to 450 kPa for Sasolburg plant; & 250 to 500 kPa for Secunda plant	These values are as per the original PDD dated 31 January 2007 /2/ and further cross-checked against the plants specification documents /4/ /5/.
$EF_{historical}$ Historical baseline emission factor of the nitric acid plant	9.46 kg N_2O/t 100% HNO_3 for Sasolburg plant; & 4.57 kg N_2O/t 100% HNO_3 for Secunda plant	These baseline emission factors were determined through the latest baseline campaign conducted in accordance with the methodology AM0034 and verified from the previous verification reports /16/
$EF_{default,y}$ Default emission factor according to the operating pressure of the ammonia burner in year *y*	8.4 to 5.0 kg N_2O/t 100% HNO_3 from 2013 to 2030 for both plants	The values are applicable for medium pressure plants as per the requirement of the methodology applied /12/.
$EF_{new,y}$ Baseline N2O emission factor for nitric acid production in year y	5.10 to 2.5 kg N_2O/t 100% HNO_3 from 2005 to 2023	The values are as per the requirement of the methodology applied /12/.

	and onwards for both plants	
$P_{product,max}$ Design capacity of nitric acid production during the first crediting period	190 000 tonnes for Sasolburg; & 290 000 tonnes for Secunda	These values are as per the original PDD dated 31 January 2007 /2/
GWP_{N2O} Global warning potential of N_2O valid for the commitment period	298 t CO_2e/t N_2O	GWP_{N2O} is taken from relevant decisions by the CMP as stated in ACM0019 (version 02.0) /12/.
R_u Universal ideal gases constant	8 314 $Pa \cdot m^3/kmol \cdot K$	R_u is the universal ideal gases constant, as specified in "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /13/.
MM_{N2O} Molecular mass of N_2O	44.02 kg/kmol for N_2O	MM_{N2O} is the molecular mass of N_2O, as specified in "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /13/.

DNV is able to verify that all the ex-ante parameters required by ACM0019 (version 02.0) and the relevant tool have been clearly stated, referenced and used in the ex-ante emission reduction calculations. The authenticity and referencing of all the parameters have been clearly described in the emission reduction calculation sheet /3/ and was checked and verified by DNV.

4.4.2 Parameters monitored ex-post

The monitoring plan includes the operational and management structure to implement the monitoring plan and provisions to ensure that data monitored and required for verification and issuance be kept and archived electronically for two years after the end of the crediting period or the last issuance of CERs, whichever occurs later. It defines responsibilities and arrangements for data collection and archiving and quality assurance and quality control (QA/QC) procedures. The uncertainty levels, methods and the associated accuracy level of measuring instruments to be used for various parameters and variables are also defined in the monitoring plan. Further, specifications of the calibration frequency for the measuring equipment are given as needed.

The following parameters will be monitored as per the requirements of applied methodology and applicable tools /12/ /13/:

- $P_{production,y}$ (Nitric acid produced in year y): At Secunda plant daily production will be measured by using a Coriolis mass flow meter along with regular concentration values. While at Sasolburg this value will be determined by daily mass balances at the end-product storage tanks with the help of electronic level indicators and load cells. Calibration of devices used will be done as per supplier's recommendations.

- h_y (Number of hours of operation in year y) and $hour_{r,y}$ (Number of hours in year y where abatement system was not installed, underperforming or failed): These values for both plants will be from the plants DCS systems.

- $F_{N2O,tail\ gas,h}$ (mass flow of N_2O): The value will be calculated by monitoring the following parameters are per the requirement of the methodological tool /13/.

- $V_{t,db}$ (Volumetric flow of the gaseous stream in time interval t on a dry basis): This value will be monitored by a monitoring system that meets the requirements of EN14181 as per the requirements of the methodology.
- $v_{i,t,db}$ (Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis): This will also be monitored by a monitoring system that meets the requirements of EN14811 as per the requirements of the methodology.

Further, P_t and T_t (i.e. the absolute pressure and temperature of the gaseous stream in time interval t)will be monitored as per the requirements of the methodology.

The option used from the applicable tool for this Project is the option A (i.e. Volume flow on dry basis). As per the SGS the QAL 2 test reports /6/ /7/; the average moisture content has been 2.2g H_2O/m^3 dry gas for Secunda and 5.2g H_2O/m^3 dry gas for Sasolburg and thus below the methodology requirements to use the option A. The nitric acid produced $P_{production,y}$ will be measured by using the nitric acid flow meter. The flow will be converted into 100% acid by multiplying the mass flow of HNO_3 with concentration, which will be determined by the test in the laboratory. The number of hours of operation h_n will be obtained from plant operation records (DCS system). The volumetric fraction of greenhouse gas i in a time interval t on a dry basis $v_{i,t,db}$ will be monitored by the AMS that complies with EN14181.

DNV confirms that the monitoring arrangements described in the monitoring plan are feasible within the project design, and the mean of implementation of the monitoring plan is able to ensure the achievement of emission reductions.

4.4.3 Management system and quality assurance

DNV has verified during site visit of 10 December 2013 that both Sasolburg and Secunda Nitric acid plants are operated by a centralized automated control system. The operational and management staff is qualified and experienced. Furthermore, both plants have access to specialized technical services available from the Sasol Technology Group, a division of Sasol Limited.

The plant manager will be responsible for the ongoing operation and maintenance of the N_2O monitoring system. Operation, maintenance, calibration and service intervals will be according to the manufacturer specifications and international standards (see QA/QC section below), and incorporated into the management structure of ISO 9001 standard procedures.

The proposed CDM project will be closely monitored, metered and recorded. The management and operation of the proposed nitrous oxide abatement project at the two Sasol plants will be the responsibility of each plant.

A detailed operational and management structure has been provided in the updated PDD version 8 dated 5 October 2014 /2/.

4.5 Algorithms and/or formulae used to determine emission reductions

The GHG emission reduction calculation spread sheet /3/ has been checked by DNV based on the approved methodology ACM0019 (version 02.0) /12/ and "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 02.0.0) /13/.

According to the methodology ACM0019 (version 02.0), any leakage emission sources are considered negligible. Hence, the emission reductions by the project activity in the crediting period are equal to the baseline emission reductions minus project emissions.

$ER_y = BE_y - PE_y$

Baseline emissions (BE_y)

According to ACM0019, for nitric acid plants that have used AM0034 in the first crediting period the baseline emissions are calculated as:

$$BE_y = \begin{pmatrix} min\{P_{production,y}\,;P_{product,max}\}\times EF_{existing,y} + \\ max\{P_{production,y}-P_{product,max};0\}\times EF_{new,y} \end{pmatrix} \times \frac{(h_y - h_{r,y})}{h_y} \times GWP_{N2O} \times 10^{-3}$$

Where:

BE_y	=	Baseline emissions in year *y* (t CO_2e)
$P_{product,max}$	=	Design capacity (t HNO_3)
$P_{production,y}$	=	Production of nitric acid in year *y* (t HNO_3)
$EF_{existing,y}$	=	N_2O emission factor for nitric acid plants that have used AM0028 or AM0034 in the first crediting period in year *y* (kg N_2O/t HNO_3)
$EF_{new,y}$	=	Baseline N_2O emission factor for nitric acid production in year *y* (kg N_2O/t HNO_3)
GWP_{N2O}	=	Global Warming Potential of N_2O valid for the commitment period
h_y	=	Number of hours in year *y* during which the plant was in operation (*h*)
$h_{r,y}$	=	Number of hours (*h*) in year *y* where: (a) For secondary N_2O abatement: the abatement system was not installed, underperforming or failed; (b) For tertiary N_2O abatement: the abatement system is by-passed, underperforming or failed

The N_2O emission factor for nitric acid plants ($EF_{exisitng,y}$) are calculated as follows:

$$EF_{existing,y} = min\{EF_{historical}; EF_{default,y}\}$$

Where:

$EF_{existing,y}$	=	N_2O emission factor for nitric acid plants that have used AM0028 or AM0034 in the first crediting period in year *y* (kg N_2O/t HNO_3)
$EF_{historical}$	=	Historical baseline emission factor of the nitric acid plant (kg N_2O/t HNO_3)
$EF_{default,y}$	=	Default emission factor according to the operating pressure of the ammonia burner in year *y* (kg N_2O/t HNO_3)

As the project has used AM0034 in the first crediting period, the abatement system will be deemed to be bypassed, not working, underperform or failed in the hour *h* in year *y* if:

$$F_{N2O,tail\ gas,h} > EF_{existing\ y} \times P_{NA,h}$$

The values for the above parameter used fixed ex-antee are stated in section 4.41 except the h_y that will be monitored. The value of h_y is assumed as 8 654 hours for Sasolbug plant and 7 922 hours for Secunda plant to calculated baseline emissions in tCO_2 (with the assumption that $h_{r,y}$ will be zero for both plants) . The values of baseline emissions thus calculated for both plants have been given in section B.6.3 and B.6.4 of the PDD. The values have been cross checked against the emission reduction estimation spreadsheet /3/.

Project emissions (PE_y)

The project emissions are calculated as follows:

$$PE_y = PE_{N2O,y} + PE_{CO2,tertiary,y}$$

Where:

PE_y	=	Project emissions in year *y* (t CO_2e)
$PE_{N2O,y}$	=	Project emissions of N_2O from the project plant in year *y* (t CO_2e)
$PE_{CO2,tertiary,y}$	=	Project emissions of CO_2 from the operation of the tertiary N_2O abatement facility in year *y* (t CO_2)

Accordingly, $PE_{N2O,y}$ is determined as follows:

$$PE_{N2O,y} = \sum_{1}^{h_y - h_{r,y}} F_{N2O,tail\ gas,h} \times GWP_{N2O} \times 10^{-3}$$

Where:

$PE_{N2O,y}$	=	Project emissions of N_2O from the project plant in year *y* (t CO_2e)
GWP_{N2O}	=	Global warming potential of N_2O valid for the commitment period
$F_{N2O,tail\ gas,h}$	=	Mass flow of N_2O in the gaseous stream of the tail gas in the hour *h* (kg N_2O/h)
h_y	=	Number of hours in year *y* during which the plant was in operation (*h*)
$h_{r,y}$	=	Number of hours (*h*) in year *y* where: (a) For secondary N_2O abatement. Abatement system was not installed, underperforming or failed; (b) For tertiary N_2O abatement. The abatement system is by-passed, underperforming or failed

$F_{N2O,tail\ gas,h}$ is determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" /13/ according to the monitored data that has been verified in the last periodic verification (for the period from 10 September 2010 to 31 July 2011) during the 1st crediting period (15.07 kg N_2O/h for Sasolburg plant and 46.72 kg N_2O/h for Secunda plant) /16/. Again, the value of h_y is assumed as 8 654 hours for Sasolbug plant and 7 922 hours for Secunda plant to calculated baseline emissions in tCO_2 (with the assumption that $h_{r,y}$ will be zero for both plants).

The values of project emissions thus calculated for both plants have been given in section B.6.3 and B.6.4 of the PDD. The values have been cross checked against the emission reduction estimation spreadsheet /3/

4.6 Estimation of GHG emissions

Based on the calculations and results presented in the sections above the implementation of the project activity will result in an average *ex-ante* estimation of emission reduction conservatively calculated to be 648 162 tCO_2e per year for the selected crediting period.

All assumptions and data used by the project participants are listed in the PDD and/or supporting documents, including their references and sources. All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD. All values used in the PDD are considered reasonable in the context of the proposed CDM project activity. The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions. All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD.

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APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Requirements checklist

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A General description of project activity						
A.1	**Title of the project activity (PS § 31, VVS § 62-63)**					
A.1.1	Does section A.1 of the PDD include a clearly identifiable project title, version number of the PDD and date of the PDD?	/1/	DR	☒ Clearly identifiable title of the project activity ☒ Version number of the PDD is included ☒ Date of the PDD is included.	OK	OK
A.1.2	Is the PDD is in accordance with the applicable requirements for completing PDDs?	/1/	DR	☐ Yes *If no, list where the PDD is not in accordance:* *The most recent PDD template has been used. However, the following requirements are not fully met:* - *One page 1, sector scope has been mentioned, however the methodology still needs to be mentioned.* - *Under section A.1, Estimated annual average and total GHG emission reductions needed to be described.* - *Para 303, VVS requires to check consistency of the names of the contact persons in the updated PDD v/s the registered PDD. In that regards, Mr. Swanepoel, Safety Health Environment and Risk Manager is not mentioned in the updated PDD (DNV understand that both persons are from Sasol).* - *Under Annex 4, further details and back ground information on ex-ante calculation of emission reduction need to be provided.*	~~CAR 1~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B Application of a baseline and monitoring methodology					
B.1 Methodology applied (VVS para 70-133 and VVS § 150-153 for small-scale project activities, as applicable)					
B.1.1 Does the project apply an approved methodology and the correct version thereof? *If during the course of validation the originally applied version of the methodology expires, a CAR shall be raised in Table 3 of the validation protocol. Any new requirements of the revised version of the methodology not yet validated in Table 2 of the validation protocol shall be validated in Table 3 as part of the assessment of the CAR raised.*	/1/	DR	The project applies ACM0019 Version 02.0.0 "N_2O abatement from nitric acid production'' and the Version 02.0.0 of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream".	OK	OK
B.2 Applicability of methodology (and tools) (VVS § 73-77) *Insert a row for each applicability criteria of the applied methodology (and tools)*					
B.2.1 How was it validated that project complies with the following applicability criteria: *The project activity introduces N_2O abatement measures in a nitric acid plant?*	/1/	DR	*The project activity involves the installation of a secondary catalyst to abate N_2O inside the reactor once it is formed.*	OK	OK
B.2.2 How was it validated that project complies with the following applicability criteria: *The nitric acid plant started commercial operation before the implementation of the CDM project activity. There was no secondary or tertiary abatement technology installed in the respective nitric acid plant?*	/1/ /15/	DR	*The project is a registered CDM project activity and this has been confirmed during validation of the original project design document.* *DNV has confirmed this applicability criteria form the review of the validation report.*	OK	OK
B.2.3 How was it validated that project complies with the following applicability criteria: *Continuous real-time measurements of the N_2O concentration and the total gas volume flow will be carried*	/1/	DR	T*he PDD refers to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" and its provisions that would be applied, which if fully adopted would ensure this*	~~CAR 2~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	out in the tail gas stream after the abatement of N_2O emissions throughout the crediting period of the project activity. An Automated Measuring System (AMS) will be installed?			*applicability criteria. However, details are missing in the PDD on the specific tool requirements and which options form the tool would be used towards calculating ''Mass flow of N_2O in the gaseous stream of the tail gas in the hour h (kg N_2O/h)'' ($F_{N2O,tail\ gas,h}$). When corrected these changes will also impact Sections B.6.2 and B.7 of the PDD.*		
B.2.4	How was it validated that project complies with the following applicability criteria: *No law or regulation which mandates the complete or partial destruction of N2O from nitric acid plants exists in the host country where the CDM project activity is implemented?*	/1/	DR	*It needs to be confirmed by regulatory analysis and by interviewing the regulatory authorities that no law or regulation which mandates the complete or partial destruction of N_2O from nitric acid plants in South Africa.*	~~CL 1~~	OK
B.3	**Project boundary (VVS § 82-87)**					
B.3.1	What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined?	/1/	DR	*The project system boundaries are the Sasol nitric acid plant and the Secunda Nitric acid Plant. The PDD clearly defines the components and facilities to mitigate GHG emissions. However, Under section B.3 (Project boundary), N_2O emissions are mentioned to be excluded under the project Scenario.*	~~CL 2~~	OK
B.3.2	Which GHG sources are identified for the project? Does the identified boundary cover all possible sources linked to the project activity? Give reference to documents considered to arrive at this conclusion.	/1/	DR	*Pending to CL 2*	~~CL 2~~	OK
B.3.3	Do the system boundaries for the project as described in the PDD fully comply with the project boundaries stipulated by the applied baseline methodology?	/1/	DR	*Pending to CL 2*	~~CL 2~~	OK
B.3.4	Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources	/1/	DR	*DNV is of the opinion that there are no other emissions sources not foreseen by the methodology that may question the applicability*	OK	OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
contribute with more than 1% of the estimated emission reductions of the project?			*of the methodology.*		
B.4 Baseline scenario determination and description (VVS § 88-95 / Identification of alternatives to the project activity (VVS § 113-116) *Ensure that the evaluation of all alternatives provided in the PDD and required by the methodology and also possible alternatives/offshoots of alternatives are discussed. Check that all alternatives required to be considered by the methodology are included in the final PDD. If baseline alternatives required to be considered by the methodology are considered not applicable, please assess the justification for this.*					
B.4.1 Which baseline scenarios have been identified? Is the list of baseline scenarios complete? Does the list include as one of the options that the project activity is undertaken without being registered as a proposed project activity? Does the list contain all plausible alternatives which are viable means of supplying the comparable outputs or services that are to be supplied by the proposed project activity?	/1/	DR	*As per the methodology ACM0019 Version 02.0, the baseline scenario is that the N_2O is emitted to the atmosphere with no N_2O abatement measure being implemented.* *DNV is of the opinion that this updated baseline is also aligned with the originally established baseline in the registered PDD.* *However, as per para 304 of the VVS, DNV has to assess the validity of the updated baseline through an assessment of the following:* - *The impact of any new regulation and or policies and circumstances taking into account relevant guidelines form board.* - *The correctness of the application of an approved baseline and monitoring methodology for the determination of the*	~~CAR 1~~ ~~CAR 2~~ ~~CL 1~~	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
				continued validity of the baseline, and the estimation of the emission reduction for the applicable crediting period. *This would be concluded upon concluding CAR 1, CAR 2, and CL 1.*		
B.4.2	Could the project activity in absence of the CDM or other baseline alternatives also be implemented by other entities than the CDM project participants? If so, has this also been included in the list of baseline scenarios?	/1/	DR	*Not applicable since the baseline scenario determination will not be done again.*	OK	OK
B.4.3	How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/	DR	*Not applicable since the baseline scenario determination will not be done again.*	OK	OK
B.4.4	What is the baseline scenario?	/1/	DR	*As per the methodology ACM0019 Version 02.0, the baseline scenario is that the N_2O is emitted to the atmosphere with no N_2O abatement measure being implemented.* *DNV is of the opinion that this updated baseline is also aligned with the originally established baseline in the registered PDD.* *Refer to discussion under B.4.1 above as well.*		
B.4.5	Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/	DR	*Not applicable since the baseline scenario determination will not be done again.*	OK	OK
B.4.6	Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR	*Not applicable since the baseline scenario determination will not be done again.*	OK	OK
B.4.7	Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies? Does the baseline scenario comply with all applicable and enforced legislation?	/1/	DR	*Pending to CL 1.*	~~CL 1~~	OK
B.4.8	Is the baseline scenario determination compatible with the available data and are all literature and sources clearly	/1/	DR	*Pending to CL 1.*	~~CL 1~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	referenced?					
B.4.9	Is the baseline determination adequately documented in the PDD? • All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. • All documentation is relevant as well as correctly quoted and interpreted. • Assumptions and data can be deemed reasonable • Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. • The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/1/	DR	*Not applicable since the baseline scenario determination will not be done again.*	OK	OK
B.5	**Calculations of GHG emission reductions**					
	Data and parameters that are available at validation and that are not monitored (VVS § 96-100)					
B.5.1	How was the ‘‘Operating pressure’’ available at validation and verified?	/1/ /2/	DR	*For ‘‘Operating pressure’’ parameter, the PDD refers to the process control system for the source of the data. However, as per the applicable methodology ACM0019, version 02, this parameters should be based on ‘‘Manufacturer Specifications’’. This needs to be clarified.* *Further, the value established for this parameter in the updated PDD is 400,000 KPa for Sasolburg and 470,000 kPa for Secunda. While the registered PDD establishes these values in the ranges 3.7 to 4.5 bar for Sasolburg and 2.5 to 5.0 bar Secunda. This needs further clarification as well.*	~~CL 3~~	OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.2	How was the $EF_{historical}$ parameter available at validation and verified?	/1/ /2/	DR	*As per the updated PDD, this parameter is based on the baseline emission factor determined through the latest baseline campaign conducted in accordance with the methodology AM0034. DNV is of the opinion that this is in line with the ACM0019 requirements. However, the values established in the updated PDD are 9.66 kg N_2O/t HNO_3 for Sasolburg and are 4.5 kg N_2O/t HNO_3 for Secunda which are different from the values in the registered PDD (9.70 kg N_2O/t HNO_3 for Sasolburg and are 4.49 kg N_2O/t HNO_3 for Secunda) and thus it needs to be clarified.* *Further, once detail on the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" added to the PDD, any parameter from the tool that are fixed ex-ante and not monitored need to be added in section B.6.2 of the PDD.*	~~CL 4~~ ~~CAR 3~~	OK OK
B.5.3	*How was the ''$EF_{default,y}$'' parameter available at validation and verified?*	/1/ /12/	DR	*Values sourced from ACM0019 based on the operating pressure of the ammonia burner. However, pending to* CL 3	~~CL 3~~	OK
B.5.4	How was the ''$EF_{new,y}$'' parameter available at validation and verified?	/1/ /12/	DR	*Values sourced from ACM0019*	OK	OK
	Baseline emissions (VVS § 96-100)					
B.5.5	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	*The PDD refers to the excel spreadsheet attached; however, no spreadsheet has been provided to DNV. Further, details and back ground information on baseline emission calculation need to be provided in relevant sections and under Annex 4 of the PDD.*	~~CL 5~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.6	Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR	Pending to CL 5.	~~CL 5~~	OK
B.5.7	Are uncertainties in the baseline emission estimates properly addressed?	/1/	DR	Pending to CL 5.	~~CL 5~~	OK
	Project emissions (VVS § 96-100)					
B.5.8	Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	*The PDD refers to the excel spreadsheet attached; however, no spreadsheet has been provided to DNV. Further, details and back ground information on project emission calculation need to be provided in relevant sections and under Annex 4 of the PDD.* *Further, once detail on the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" added to the PDD, any parameter from the tool that are monitored need to be added in section B.7.1 of the PDD.*	~~CL 5~~ ~~CAR 4~~	OK OK
B.5.9	Have conservative assumptions been used when calculating the project emissions?	/1/	DR	Pending to CL 5.	~~CL 5~~	OK
B.5.10	Are uncertainties in the project emission estimates properly addressed?	/1/	DR	Pending to CL 5.	~~CL 5~~	OK
	Leakage (VVS § 96-100)					
B.5.11	Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR	*Any leakage emissions sources are deemed to be negligible.*	OK	OK
B.5.12	Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR	*NA*	OK	OK
B.5.13	Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR	*NA*	OK	OK

Checklist Question		Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	Emission Reductions (VVS § 96-100)					
B.5.14	Algorithms and/or formulae used to determine emission reductions: • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced • All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity • The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.	/1/	DR	*The PDD refers to ACM0019 and the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The formulas and assumptions from the methodology are mentioned in the PDD. However, details on the calculation choices from the tool on the specific tool requirements and which options form the tool would be used towards calculating ''Mass flow of N_2O in the gaseous stream of the tail gas in the hour h (kg N_2O/h)'' ($F_{N2O,tail\ gas,h}$) are missing from the PDD.*	~~CAR 2~~	OK
B.6	**Monitoring plan (VVS § 131-133)**					
	Data and parameters monitored					
B.6.1	Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/	DR	*The means of monitoring as per the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" needs to be described clearly in the updated PDD.*	~~CAR 4~~	OK
B.6.2	Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/	DR	Pending to CAR 4.	~~CAR 4~~	OK
B.6.3	In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR	Pending to CAR 4.	~~CAR 4~~	OK
B.6.4	In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR	Pending to CAR 4.	~~CAR 4~~	OK
B.6.5	In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant	/1/	DR	Pending to CAR 4.	~~CAR 4~~	OK

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	Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	parameter.					
B.6.6	Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	Pending to CAR 4.	~~CAR 4~~	OK
B.6.7	Is the recording frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR	Pending to CAR 4.	~~CAR 4~~	OK
	Ability of project participants to implement monitoring plan					
B.6.8	How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/	DR	Yes. Details provided in section B.7.3 of the PDD. Confirmed during interviews with PP on 10 December 2013.	OK	OK
B.6.9	Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process performance documentation)?	/1/	DR	Yes. Details provided in section B.7.3 of the PDD. Confirmed during interviews with PP on 10 December 2013.	OK	OK
B.6.10	Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/1/	DR	Yes. Details provided in section B.7.3 of the PDD. Confirmed during interviews with PP on 10 December 2013.	OK	OK
B.6.11	Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR	*It is not stated in the PDD that all monitored data required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later.*	~~CAR 5~~	OK

Table 2 Resolution of corrective action requests and clarification requests

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CAR 1 *The most recent PDD template has been used. However, the following requirements are not fully met:* - *One page 1, sector scope has been mentioned, however the methodology still needs to be mentioned.* - *Under section A.1, Estimated annual average and total GHG emission reductions needed to be described.* - *Para 303, VVS requires DNV to check consistency of the names of the contact persons in the updated PDD v/s the registered PDD. In that regards, Mr. Swanepoel, Safety Health Environment and Risk Manager is not mentioned in the updated PDD (DNV understand that both persons are from Sasol).* - *Under Annex 4, further details and back ground information on ex-ante calculation of emission reduction need to be provided.*	A.1.2	The PDD has been revised and the version 8.1 of the document has been provided to the DOE. The questions were properly addressed: - The methodology name was added in the PDD front page; - Section A.1 was revised and the total CER generation estimation information was added; - MR Swanepoel contact details were added on appendix 1; - Additional information was presented in Appendix 4 with background information on ex-ante calculations	The PDD version 8 dated 5 October 2013 has been provided and DNV confirms that following edits have been made: - The methodology has been added on front page of the PDD; - Section A.1 has been revised and total CER generation estimation information has been added; - MR. Swanepoel contact details have been added in Appendix 1; - Additional information has been presented in Appendix 4 with background information on ex-ante calculations of emission reductions Therefore, CAR 1 is closed.
CAR 2 *The PDD refers to the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" and its provisions that would be applied, which if fully adopted would ensure this applicability criteria. However, details are*	B.2.3 B.5.14	The PDD has been revised and the version 8.1 of the document has been provided to the DOE. The option used to calculate the mass flow of N_2O is the option A. Sections 6 and 7 were adjusted to reflect this option.	The PDD has been updated with the provisions of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". Further details on options form the tool have been provided in the updated PDD. Moreover, all corresponding changes have

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
missing in the PDD on the specific tool requirements and which options form the tool would be used towards calculating ''Mass flow of N_2O in the gaseous stream of the tail gas in the hour h (kg N_2O/h)'' ($F_{N2O,tail\ gas,h}$). When corrected these changes will also impact Sections B.6.2 and B.7 of the PDD.			been made in the updated PDD. Therefore, CAR 2 is closed.
CAR 3 *Once detail on the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" added to the PDD, any parameter from the tool that are fixed ex-ante and not monitored need to be added in section B.6.2 of the PDD.*	B.5.2	The PDD has been revised and the version 8.1 of the document has been provided to the DOE. The option used to calculate the mass flow of N_2O is the option A. Sections 6 and 7 were adjusted to reflect this option.	The updated PDD has been provided and the parameters from the tool that are fixed ex-ante and not monitored are now added in section B.6.2 of the updated PDD. Therefore, CAR 3 is closed.
CAR 4 *Once detail on the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" added to the PDD, any parameter from the tool that are monitored need to be added in section B.7.1 of the PDD.*	B.5.8 B.6.1	The PDD has been revised and the version 8.1 of the document has been provided to the DOE. The option used to calculate the mass flow of N_2O is the option A. Sections 6 and 7 were adjusted to reflect this option.	The updated PDD has been provided and the parameters from the tool that are monitored are now added in section B.7.1 of the updated PDD. Therefore, CAR 4 is closed.
CAR 5 *It is not stated in the PDD that all monitored data required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later.*	B.6.11	The PDD has been revised and the version 8.1 of the document has been provided to the DOE. Section B.7.3 was revised and a statement related to this CAR was added.	It has been stated in section B.7.3 of the PDD that all the monitored data required to calculate the ERs and used as part of verifications will be kept for at least two years after the end of crediting period or the last issuance of CERs, whichever occurs later. Therefore, CAR 5 is closed.
CL 1 *It needs to be confirmed by regulatory analysis*	B.2.4	On December 2013 a meeting was arranged between DOE and South African DNA. During this meeting, the South African	DNV by interviewing the South African DNA confirmed that the Carbon Tax system in South Africa is in proposal stage.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
and by interviewing the regulatory authorities that no law or regulation which mandates the complete or partial destruction of N_2O from nitric acid plants in South Africa.		DNA was interviewed. They provided some further details about the potential carbon tax system to be implemented in South Africa Currently there are only discussions about the implementation of a Carbon Tax system in South Africa, it is only a regulation proposal. By the time the PDD was written there was no enforced regulation that would impact the baseline of project activity. The Carbon tax proposal as it is now will not impact the project baseline. The proposed tax system does not impose any kind of cap or benchmark for N_2O emissions and does not generate any kind of carbon credit or tax credit. Based on that it is clear that there is no double counting issues or N_2O emissions capping issues. The South African Carbon regulatory development will continuously be monitored and in every verification the new enforced regulations will be assessed to see if they would generate any impact on the baseline scenario of this CDM project.	DNV also confirmed during interviews with DNA of South Africa that there was no enforced regulation that would impact the baseline of project activity. OK. Since the South African Carbon regulatory development will continuously be monitored by PP, and in every verification, the new enforced regulations will be assessed to see if they would generate any impact on the baseline scenario of this CDM project. Therefore, CL 1 is closed by raising FAR 1.
CL 2 *The project system boundaries are the Sasol nitric acid plant and the Secunda Nitric acid Plant. The PDD clearly defines the components and facilities to mitigate GHG emissions. However, Under section B.3 (Project boundary), N_2O emissions*	B.3.1	The PDD has been revised and the version 8.1 of the document has been provided to the DOE. In the revised version it is clearly stated that N_2O emissions are included in the boundaries.	The updated PDD has been provided and now the N_2O emissions are included. Therefore, CL 2 closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
are mentioned to be excluded under the project Scenario.			
CL 3 *For ''Operating pressure'' parameter, the PDD refers to the process control system for the source of the data. However, as per the applicable methodology ACM0019, version 02, this parameters should be based on ''Manufacturer Specifications''. This needs to be clarified.* *Further, the value established for this parameter in the updated PDD is 400,000 KPa for Sasolburg and 470,000 kPa for Secunda. While the register PDD establishes these values in the ranges 3.7 to 4.5 bar for Sasolburg and 2.5 to 5.0 bar Secunda. This needs further clarification as well.*	B.5.1 B.5.3	The PDD has been revised and the version 8.1 of the document has been provided to the DOE. In the revised version the "Operating Pressure" parameter value refers to Manufacturer specifications. These specifications give a range rather than a specific value. However the range is within the Medium pressure range, clearly indicating that both plants are Medium Pressure plants. The difference in the values (400/470 KPa vs. 3.7-4.5 Bar and 2.5-5 Bar) was related to the usage of difference source of information (operational Procedures vs. Manufacturer info).	The PDD has been updated and provided to DNV. In the updated PDD, the "Operating Pressure" parameter value refers to Manufacturer specifications. Further manufacturer specifications docs have been provided for both Secunda and Sasolburg plant. These specifications gives a range rather than a specific value. However the range is within the Medium pressure range, clearly indicating that both plants are Medium Pressure plants. The difference in the values (400/470 KPa vs. 3.7-4.5 Bar and 2.5-5 Bar) was related to the usage of difference source of information (operational Procedures vs. Manufacturer info) and was confirmed from the manufacturer specifications docs. Therefore, CL 3 is closed.
CL 4 *As per the updated PDD, this parameter* (i.e. EF_{BL}) *is based on the baseline emission factor determined through the latest baseline campaign conducted in accordance with the methodology AM0034. DNV is of the opinion that this is in line with the ACM0019 requirements. However, the values established in the updated PDD are 9.66 kg N_2O/t HNO_3 for Sasolburg and are 4.5 kg N_2O/t HNO_3 for Secunda which are different from*	B.5.2	The registered PDD for the first crediting period clearly states on page 31: "An N_2O emission factor (EF_{BL}) calculated from monitored data available at the moment of submitting this PDD. The final baseline emission factor will be calculated after the completion of baseline campaign measurements." The final numbers from the Baseline Campaign were presented in the Final	DNV agrees since the registered PDD states that the final baseline emission factor will be calculated after the completion of baseline campaign measurements. The final numbers from the Baseline Campaign are from the Final Monitoring Report related to the first verification . The Baseline Emission Factor (EF_{BC}) for Baseline Campaign for Sasolburg and

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
the values in the registered PDD (9.70 kg N_2O/t HNO_3 for Sasolburg and are 4.49 kg N_2O/t HNO_3 for Secunda) and thus it needs to be clarified.		Monitoring Report related to the first Verification (page 17 of the Final Monitoring Report) . The Baseline Emission Factor (EF_{BC}) for Baseline Campaign for Sasolburg and Secunda were respectively 0.00946 and 0.00457 ton N2O/ton HNO3. The PDD has been revised and the version 8 of the document has been provided to the DOE. The revised version presented the numbers above as $EF_{historical}$ for each plant.	Secunda were confirmed respectively 0.00946 and 0.00457 ton N2O/ton HNO_3 and have correctly been used in the baseline line emission calculations and correctly reflected in the updated PDD. Therefore, CL 4 is closed.
CL 5 *The PDD refers to the excel spreadsheet attached; however, no spreadsheet has been provided to DNV. Further, details and back ground information on baseline emission calculation need to be provided in relevant sections and under Annex 4 of the PDD.*	B.5.5 B.5.8	Based on corrections done to the version 8.1 of the PDD, an excel spreadsheet named "SasolN20_ACM0019_Revised-final.xlsx" was provided to the DOE together with the revised PDD and answers to CAR/CLs.	Excel sheet named "SasolN20_ACM0019_Revised-final.xlsx" has been provided and reviewed by DNV. Values have been cross checked against the PDD and referred sources. Changes have been correctly referred in the updated PDD. Therefore, CL 5 is closed.

Table 3 Forward action requests

Forward action request	Reference to Table 1	Response by project participants
FAR 1 *The South African Carbon regulatory development should continuously be monitored by the project proponent, and for every verification, the new enforced regulations should be assessed to see if these would have any impact on the baseline scenario of this CDM project.*	B.2.4	The South African Carbon regulatory development will continuously be monitored and in every verification the new enforced regulations will be assessed to see if they would generate any impact on the baseline scenario of this CDM project.

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APPENDIX B

CURRICULA VITAE OF THE VALIDATION TEAM MEMBERS

Rafi Khawaja

Mr. Rafi Khawaja holds a Master's Degree in Environmental Engineering with over 10 years of experience in air pollution control technology, air pollution monitoring, risk management reviews, ambient air quality analysis, transport phenomena, urban and industrial air quality management. He has acquired over six years of experience in validation and verification of numerous CDM and JI projects while working in DNV. He has been qualified as a CDM validator/technical reviewer for technical area Renewables and as a CDM validator/verifier as well as a Technical Reviewer (TR) for technical area N_2O (i.e. under Methodology group 11) under the Qualification Scheme of Climate Change Services of DNV.

Trine Kopperud

Trine Kopperud holds a Bachelor First Honours Degree in Chemical and Process Engineering with an overall experience of around_25 years in chemical process industries. Prior to joining DNV she has gained experience from fertiliser production (including ammonia, nitric acid and catalysts production and sales), magnesium production and energy efficiency. Positions in research and operations including 5 year experience in N_2O abatement technologies (research & development, operation, application and sales).

She has experience of 5 years in validation and verification of CDM projects/JI in several countries including China, India, Africa, Middle East and Eastern Europe.

Her qualification, industrial experience and experience in CDM/JI demonstrate her sufficient sectoral competence in Chemical Processes Industries TA 5.1/11.1/12.1. and Metal production TA 9.1.

Ravi Kumar Prabhu

***Ravi Kumar Prabhu** holds Bachelor's Degree in Chemical Engineering and has done Post Graduate Diploma course in Management and has an overall working experience of around twenty five years. Prior to joining DNV has around twenty three years of experience in Chemical process industry (fertilizer & petrochemical manufacturing) covering production, technical services including energy audits and efficiency studies, waste heat recovery, efficiency studies of boilers, power plants, safety audits, pollution control activities and waste water treatment. With respect to the Thermal Power Plant, the job assignment included the monitoring of flue gas stack temperatures and excess air, efficacy of fuel additives, condition of boiler refractory and insulation of steam lines, residual life assessment of boilers etc. His experience also includes 7 years in the Process design of fertilizer & petrochemical plants, wherein he was involved in the development of process flow diagrams, development of P&IDs, equipment design, HAZOP studies, procurement and commissioning activities.*

He has six years of experience in validation and verification of CDM projects in DNV and is also an EMS lead auditor. His qualification, industrial experience and experience in CDM projects demonstrate sufficient sectorial competence in Chemical Process Industries (TA 5.1), Thermal Energy Generation from fossil fuels (TA1.1), Heat distribution (TA 2.2), Energy generation from Renewable Energy sources (TA 1.2) and Waste handling and disposal (TA 13.1).

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