ASSESSMENT REPORT

GFA CONSULTING GROUP

CALCULATION OF THE EMISSION FACTOR OF THE ELECTRICITY SYSTEM OF SOUTHERN AFRICA

Report No: 8000471259 – 16/182

Date: 2017-04-27

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Verification Report:	***Report No.***	***Rev. No.***	***Date of 1st issue:***	***Date of this rev.***
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Standardized Baseline:	***Title:***			
	Calculation of the Emission Factor of the Electricity System of Southern Africa			
Entities(s):	***Client:***			
	GFA Consulting Group			
	Non Annex 1 country:		***Annex 1 country:***	
	The Republic of Botswana; The Democratic Republic of the Congo (DRC); The Kingdom of Lesotho; The Republic of Mozambique; The Republic of Namibia; The Republic of South Africa; The Kingdom of Swaziland; The Republic of Zambia; Zimbabwe			
	PP from non-Annex 1 country:		***PP from Annex 1 country:***	
	N/A		N/A	
Related methodology/ies:	***Title:***		***No.:***	***Scope(s) / TA(s)***
	Standardized baseline: Grid emission factor for the Southern African power pool		ASB0001 Version 1.1	Power Sector
Assessment team / Technical Review and Final Approval:	***Assessment Team:***		***Technical review:***	***Final approval:***
	Evgeni Sud (TL, TE)		Sergej Friesen / Rainer Winter	Rainer Winter
Key dates of validation Assessment:		***Draft Report Issued:***	***On-site (from):***	***On-site (to):***
		2017-03-31	N/A	N/A
Summary of Assessment opinion	GFA Consulting Group has commissioned the TÜV NORD JI/CDM Certification Program to carry out the assessment of the: "Calculation of the Emission Factor of the Electricity System of Southern Africa", with regard to the relevant requirements for CDM standardized baselines. As a result of this of the assessment, the DOE confirms that: ☒ all data acquired for the purpose of SB development is relevant, current and consistent ☒ data gaps identified have been filled through conservative means such as extrapolation ☒ the data delivery protocol is complete and consistent with the data template, ☒ the QA/QC protocol is in place and functional ☒ the SBs are calculated without material misstatements in a conservative and appropriate manner.			
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Abbreviations:

AMS	**Automated Measuring System**
AST	**Annual Surveillance Test**
CA	**Corrective Action / Clarification Action**
CAR	**Corrective Action Request**
CDM	**Clean Development Mechanism**
CER	**Certified Emission Reduction**
CO_2	**Carbon dioxide**
CO_{2eq}	**Carbon dioxide equivalent**
CL	**Clarification Request**
DVerR	**Draft Verification Report**
DWRM	**Directorate of Water Resource Management**
ER	**Emission Reduction**
ETS	**Emission Trading Scheme**
FAR	**Forward Action Request**
GHG	**Greenhouse gas(es)**
MP	**Monitoring Plan**
MR	**Monitoring Report**
NWSC	**National Water and Sewage Corporation**
PA	**Project Activity**
PCS	**Process Control System**
PDD	**Project Design Document**
PP	**Project Participant**
PS	**Project Standard**
QA/QC	**Quality Assurance / Quality Control**
SAPP	**Southern African Power Pool**
SB	**Standardized Baseline**
UNFCCC	**United Nations Framework Convention on Climate Change**
VVS	**Validation and Verification Standard**
XLS	**Emission Reduction Calculation Spread Sheet**

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1. INTRODUCTION

GFA Consulting Group has commissioned the TÜV NORD JI/CDM Certification Program (CP) to carry out the assessment of the proposed

"Calculation of the Emission Factor of the Electricity System of Southern Africa"

with regard to the relevant UNFCCC requirements. The assessment team has reviewed the corresponding data collection procedures, processes and compilation used in the establishment of the proposed standardized baselines.

Related data and vintages for the proposed standardized baseline was validated in a detailed manner applying the set of requirements, audit practices and principles as required under the Validation and Verification Standard /VVS/ as well as related Guidelines/GUIDE/ and Procedures/PROC1//PROC2/ of the UNFCCC.

This report summarizes the findings and conclusions of this assessment of the above mentioned standardized baselines.

1.1. Objective

The objective of the assessment is the review and determination by an independent entity of the data acquisition procedures and the development of the standardized baselines. It includes the assessment and validation of the:

- Completeness, consistency, accuracy, and relevance of all data vintages
- Data acquisition processes applied & steps taken to fill identified data gaps
- All reference sources & quality of evidence,
- QA/QC system
- Roles and responsibilities
- Management System

1.2. Scope

The assessment of standardized baselines is based on the SB reports/SB1//SB2/, SB calculation spread sheet /XLS/, supporting documents made available to the DOE, and information collected through performing interviews and during assessments. Furthermore publicly available information was considered as far as available and required.

The assessments were carried out on the basis of the following requirements, applicable for this project activity:

- Article 12 of the Kyoto Protocol /KP/,
- guidelines for the implementation of Article 12 of the Kyoto Protocol as presented in the Marrakech Accords under decision 3/CMP.1 /MA/, and subsequent decisions made by the Executive Board and COP/MOP,
- other relevant rules, including the host country legislation,

- CDM Validation and Verification Standard/VVS/,
- Approved CDM Methodologies/AMS/.
- Relevant SB Procedures/PROC1//PROC2/.

2. GHG PROJECT DESCRIPTION

2.1. Description of the Standardized Baseline

This standardized baseline provides the values of the CO2 emission factors for the interconnected electricity system of the Southern African Power Pool (SAPP) and it is applicable to the group of countries of the SAPP (hereinafter referred to as the SAPP member countries).

2.2. SB Location

The details of the project location are given in Table 2-1:

Table 2-1: Project Location

No.	Project Location
Host Country	The Republic of Botswana; The Democratic Republic of the Congo (DRC); The Kingdom of Lesotho; The Republic of Mozambique; The Republic of Namibia; The Republic of South Africa; The Kingdom of Swaziland; The Republic of Zambia; Zimbabwe
Region:	All regions
Project location address:	N/A
Latitude:	N/A
Longitude:	N/A

3. METHODOLOGY AND ASSESSMENT SEQUENCE

3.1. Assessment Steps

The assessment consisted of the following steps:

- Contract review
- Appointment of team members and technical reviewers
- A desk review of the draft SB Reports/SB1/ submitted by the client and additional supporting documents with the use of customised checklist protocol consistent with appropriate guidelines and procedures
- Assessment planning,
- On-Site assessment (if applicable),
- Background investigation and follow-up interviews with personnel of the project developer and its contractors,
- Draft reporting
- Resolution of corrective actions (if any)
- Final reporting
- Technical review
- Final approval of the assessment.

3.2. Contract review

To assure that

- the assignment falls within the scopes for which accreditation is held,
- the necessary competences to carry out the assessment can be provided,
- Impartiality issues are clear and in line with the CDM accreditation requirements

a contract review was carried out before the contract was signed.

3.3. Appointment of team members and technical reviewers

On the basis of a competence analysis and individual availabilities an assessment team, consisting of one team leader and 1 additional team member, was appointed.

The list of involved personnel, the tasks assigned and the qualification status are summarized in the Table 3-1 below.

Table 3-1: Involved Personnel

	Name	Company	Function [1]	Qualification Status [2]	Scheme competence [3]	Technical competence [4]	Validation competence [5]	Host country Competence	On-site visit
☒ Mr. ☐ Ms.	Evgeni Sud	TN CERT GmbH	TL	SA	☒	1.2	☒	☐	☐
☒ Mr. ☐ Ms.	Sergej Friesen	TN CERT GmbH	TR[A)]	LA	☒		☐	☐	☐
☒ Mr. ☐ Ms.	Rainer Winter	TN CERT GmbH	TR/FA[B)]	SA	☒	1.2	☒	☐	-

1) TL: Team Leader; TM: Team Member, TR: Technical review; OT: Observer-Team, OR: Observer-TR; FA: Final approval
2) GHG Auditor Status: A: Assessor; LA: Lead Assessor; SA: Senior Assessor; T: Trainee; TE: Technical Expert
3) GHG auditor status (at least Assessor)
4) As per S01-MU03 or S01-VA070-A2 (such as 1.1, 1.2, …)
5) In case of verification projects

A) Team Member: GHG auditor (at least Assessor status), Technical Expert (incl. Host Country Expert or Verification Expert), not ETE
B) No team member

All team members contributed to the review of documents, the assessment of the project and to the preparation of this report under the leadership of the team leader.

Statements of competence for the above mentioned team members are enclosed in annex 2 of this report.

Assessment Protocol

In order to ensure consideration of all relevant assessment criteria, a validation assessment protocol is used. The protocol shows, in a transparent manner, criteria and requirements, means of assessment/validation and the results from pre-validating the identified criteria. The validation protocol reflects the generic requirements each standardized baseline has to meet as well as project specific issues as applicable. The protocol serves the following purposes:

- It organises, details and clarifies the requirements that a SB is expected to meet;
- It ensures a transparent assessment process where the DOE will document how a particular requirement has been validated and the result of the determination.

The assessment protocol is described in Figure 3-2.

SB specific checklist

In order to ensure transparency and consideration of all relevant assessment criteria, an assessment protocol has been developed. The protocol shows, in a transparent manner, criteria and requirements, means and results of the SB assessment. The assessment protocol serves the following purposes:

- It organises, details and clarifies the requirements a standardized baseline is expected to meet
- It ensures a transparent assessment process where the DOE documents how a particular requirement has been proved and the result of the validation.

The basic structure of this project specific validation protocol is described in Table 3-2.

Table 3-2: Table A-2; Structure of the SB checklist

Validation Protocol Table A-1: Requirement checklist				
Checklist Item	***Validation Team Comment***	***Reference***	***Draft Conclusion***	***Final Conclusion***
The checklist items in Table A-1 are linked to the various requirements the SB should meet. The checklist is organised in various sections. Each section is then further sub-divided as per the requirements of the topic.	*The section is used to elaborate and discuss the checklist item in detail. It includes the assessment of the validation team and how the assessment was carried out. The reporting requirements of the VVS if applicable shall be covered in this section.*	*Gives reference to the information source on which the assessment is based on*	*Assessment based on evidence provided if the criterion is fulfilled (OK), or a CAR, CL or FAR (see below) is raised. The assessment refers to the draft validation stage.*	*In case a corrective action or a clarification the final assessment at the final validation stage is given.*

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

3.4. Desk review

The completed draft reports and supporting background documents related to the proposed SBs were reviewed.

Furthermore, the assessement team used additional documentation by third parties like host party legislation, technical reports referring to the SBs or to the basic conditions and technical data.

3.5. On-site assessment

The assessment team has not carried out a site visit. In order to assess the information included in the SB documentation and to gain additional information

regarding the compliance of the proposed SBs with the relevant criteria applicable for CDM assessment team has conducted telephone interviews with the personnel involved in the development of the updated Approved Standardized Baseline ASB0001.

Before and during the documents review the assessment team performed interviews with the client to confirm selected information and to resolve issues identified in the document review.

Representatives of the GFA Consulting Group, representatives of the Southern African Power Pool Coordination Centre as well as further involved personnel were interviewed. The main topics of the interviews are summarised in Table 3-2.

Table 3-2: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
1. GFA Consulting Group 2. Representatives of SAPP Coordination Center 3. SB consultant	- General aspects of the SBs - Quality management system - Involved personnel and responsibilities - data management - Data collection, data sources, relevance, quality, vintages - Data uncertainty, gaps, and residual risks - SB calculation - Procedural aspects of the assessment - SBs additionality criteria

The list of interviewees is included in chapter 7.4.

3.6. Draft Assessment reporting

On the basis of the desk review, the on-site visit, follow-up interviews and further background investigation the SB assessment protocol is completed. This protocol together with a general procedural description of the assessment and a detailed list of the assessment findings form the draft assessment report. This report is sent to the client for resolution of raised CARs, CLs and FARs.

3.7. Resolution of CARs, CLs and FARs

Non-conformities raised during the assessments can either be seen as a non-fulfilment of criteria ensuring the proper establishment of a reliable SB.

Corrective Action Requests (CARs) are issued, if:

- Non-conformities with the guidelines and procedures are found in data acquisition and reporting, or if the evidence provided to prove conformity is insufficient;
- Mistakes have been made in applying assumptions, data or calculations which will impair the final result of the SBs;

The assessment team uses the term Clarification Request (CL), which is be issued if:

- information is insufficient or not clear enough to determine whether the applicable requirements have been met.

Forward Action Requests (FAR) indicate essential risks for further assessments. Forward Action Requests are issued, if:

- the reporting require attention and / or adjustment for the next SB update period.

For a detailed list of all CARs, CLs and FARs raised in the course of the assessment pl. refer to chapter 4.

3.8. Final reporting

Upon successful closure of all raised CARs and CLs the final assessment report including a positive assessment opinion can be issued. In case not all essential issues could finally be resolved, a final report including a negative assessment opinion is issued.

The final report summarizes the final assessments w.r.t. all applicable criteria.

3.9. Technical review

Before submission of the final assessment report a technical review of the whole assessment procedure is carried out. The technical reviewer is a competent GHG auditor being appointed for the scope this project falls under. The technical reviewer is not considered to be part of the validation or assessment team and thus not involved in the decision making process up to the technical review.

As a result of the technical review process the assessment opinion and the topic specific assessments as prepared by the assessment team leader may be confirmed or revised. Furthermore reporting improvements might be achieved.

3.10. Final approval

After successful technical review of the final report an overall (esp. procedural) assessment of the complete assessment will be carried out by a senior assessor located in the accredited premises of TÜV NORD.

Only after this step the request for approval can be started (in case of a positive assessment opinion).

4. ASSESSMENT FINDINGS

In the following paragraphs the findings from the desk review of the standardized Baseline reports/SB/, the calculation spreadsheet/XLS/, datasets/SB1/SB2/ and other supporting documents, as well as from the on-site assessment and the interviews are summarised.

The summary of CAR, CL and FAR issued are shown in Table 4-1:

Table 4-1: Summary of CAR, CL and FAR

Assessment topic	No. of CAR	No. of CL	No. of FAR
A – Description of Standardized Baseline	0	0	0
B – Data Acquisition Procedures	0	0	0
C – Management System (QA/QC)	0	0	0
D – Data and parameters	0	2	0
E – Roles and Responsibilities	0	0	0
SUM	**0**	**2**	**0**

The following tables include all raised CARs, CLs and FARs and the assessments of the same by the assessment team. For an in depth evaluation of all assessment items it should be referred to the assessment protocols (see Annex).

Finding	1		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	Please clarify the slight differences between the fuel specific data used.		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details. In case the MR is changed as part of the CA, the PP is requested to indicate the revised sections as well as the new version No.*	Some power plants keep their fuel specific data confidential due to the commercial reasons. In such cases fuel specific data was determined based on conservative approach as described in the study.		
	☐ Changes in	Section(s):	New version No.:
	☐ Changes in XLS	Worksheet(s):	New version No.:

Finding	1
DOE Assessment #1 *The assessment shall encompass all open issues in annex A-1. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	The data hase been checked and found appropriate. The determination method applied in the Excel spreadsheet complies with the provisions of the SAPP study.
Conclusion *Tick the appropriate checkbox*	☒ To be checked during the next SB update ☐ Additional action should be taken (finding remains open) ☐ The finding is closed

Finding	2		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding *Describe the finding in unambiguous style; address the context (e.g. section)*	The energy generation figures for SNEL power plants (in the Table "base data" Cells L120-N127) slightly deviates from the original data. Please clarify why?		
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details. In case the MR is changed as part of the CA, the PP is requested to indicate the revised sections as well as the new version No.*	The figures in the original data has been slightly revised as a result of the quality control.		
	☐ Changes in	Section(s):	New version No.:
	☐ Changes in XLS	Worksheet(s):	New version No.:
DOE Assessment #1 *The assessment shall encompass all open issues in annex A-1. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	The provided data has been checked and the deviations have been explained by the representatives of the SAPP Coordination Center. Provided data was assessed as appropriate.		
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the next SB update ☐ Additional action should be taken (finding remains open) ☒ The finding is closed		

5. SUMMARY OF SB ASSESSMENTS

The following paragraphs include the summary of the final validation assessments after all CARs and CLs are closed out. For details of the assessments pl. refer to the discussion of the assessment findings in chapter 04 and the assessment protocol (Annex 1).

5.1. Involved Parties

The proposed standardized baseline (SB) covers nine counties. These are the Botswana, Democratic Republic of Congo (DRC), Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. Given this setup, the Project Electricity System (PES) is defined as the electricity grid shared by the nine member countries.

The SBs have been developed by the GFA Consulting Group on behalf of German Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Buildings (BMUB) with the support of the Southern African Power Pool Coordination Centre.

5.2. Related methodology (ies)

- The calculation of the grid emission factor is based on the most recent version of UNFCCC's "Tool to calculate the emission factor for an electricity system" (Version 5.0)
- Guidelines for the establishment of sector specific standardized baselines (Version 02.0)

These proposed voluntary SBs do not supersede any sections including applicability criteria set by the eligible methodologies above. The result of these SBs can only be applied as the baseline of the prospective CDM projects only if they comply with the methodology in all relevant aspects.

5.3. Data Management and acquisition

Data management and acquisition process is managed by the Southern African Power Pool Coordination Centre (SAPP). The Southern African Power Pool (SAPP) is a cooperation of the national electricity companies in Southern Africa under the auspices of the Southern African Development Community (SADC).

SAPP requests power utilities to submit relevant data by using uniform data protocol.

Based on the provided data the grid emission factor is calculated. The calculation is based on the most recent version of UNFCCC's "Tool to calculate the emission factor for an electricity system" (Version 5.0). The calculation itself is performed

using an adopted an excel file for the calculation of the GEF which was developed by the Institute for Global Environmental Strategies (IGES). This assures uniformity of the collected data in term units used (e.g. MWh, etc) and reference periods amongst data provided.

However, not all power utilities had complete datasets with respect to the fuel consumption and fuel heat rates, and therefore conservative estimates have been used in filling up the data gaps.

Power generation data provided directly by the member power utilities. Provided data was crosschecked and consolidated by the SAPP. Therefore, the accuracy of this data is not in doubt.

5.4. Assessment of Sampling (if applicable)

No sampling approach has been applied in the estimation of any parameters used in determining the SBs. All data has been checked and applied, hence, sampling is not applicable.

5.5. Algorithms and/or formulae used to determine the SB

The calculation of the grid emission factor follows the requirements of the UNFCCC's "Tool to calculate the emission factor for an electricity system" (Version 5.0). The calculation is performed in a dedicated excel file that was developed by the Institute for Global Environmental Strategies (IGES). The algorithms and formulae used to determine the SB has been checked and the overall correctness of the emission factor could be confirmed. For details with respect to the assessment please refer to the Annex I of this report.

5.6. QA/QC Management System

As per the requirements of the Guideline: *Quality assurance and quality control of data used in the establishment of standardized baselines* (CDM-EB66-A49-GUID), the DOE has assessed the following elements of the QA/QC protocol against the data quality objectives outlined in the guideline. The QA/QC protocol is included as Annex IV in both SB reports.

Table 5-1

	Element	DOE Assessment
a.	System availability	A standardized data collection system is in place and procedures outlined in the data delivery template. The template is assessed as complete and consistent in the acquisition of relevant, complete, and current data. Data is collected from the power utilities using a uniform data request protocol.
b.	Conformity	The QA/QC protocol ensures that data quality objectives are met. Where there were data gaps, conservative estimates based on existing data and were consistently applied. The datasets were acquired transparently and cross-checked by the assessment team. This relates mainly to the cases where power utilities didn't provide information about the fuel consumption and its net calorific value. Conservative estimates have been done in accordance with the respective provisions of the "tool"/Tool/.
c.	Traceability	Information and data used in determination of the SB was cross-checked by GFA Consulting Group, the SB consultant as well as the SAPP. All the data has been critically assessed for relevance, completeness and consistency, and the calculations were found to be clear and traceable. The reports from power utilities and further relevant data were available for validation.
d.	Security	A security system for data management is in place in the SAPP office. All data collected is saved electronically and paper reports are filed away securely. The SAPP office did not show any possible lapses in terms of data protection. No incidents related to data security have been reported.
e.	Error tolerance	The SAPP, through the QA/QC system has sought to minimize errors and has established procedures to identify and correct errors. These procedures as outlined in the reports have been assessed to be sufficient.

5.7. Overall Aspects of the Assessment

The data used for the estimation of the Electricity System of Southern Africa were collected directly from individual power plants by SAPP and GFA Consulting teams.

The DOE assessment team was given full access to respective data and accorded the necessary interviews from key personnel relevant to the datasets acquired.

5.8. DOE Recommendations

No recommendations.

6. VALIDATION AND ASSESSMENT STATEMENT

GFA Consulting Group has commissioned the TÜV NORD JI/CDM Certification Program to carry out the assessment of the: "*Calculation of the Emission Factor of the Electricity System of Southern Africa*", with regard to the relevant requirements for CDM standardized baselines.

In the course of the assessments 5 Corrective Action Requests (CAR) and 4 Clarification Requests (CL) were raised and successfully closed. The assessment is based on the draft SB reports, revised SB reports, the provided datasets, the SB calculation spreadsheet and supporting documents made available to the TÜV NORD JI/CDM CP by the client.

As a result of this assessment, the DOE confirms that:

- all data acquired for the purpose of SB development is relevant, current and consistent
- the SB have been developed in accordance with the The calculation of the grid emission factor is based on the most recent version of UNFCCC's "Tool to calculate the emission factor for an electricity system" (Version 5.0)/Tool/
- identified data gaps have been filled through conservative means in accordance with the provisions of the tool/Tool/
- the data delivery protocol is complete and consistent with the data template.

As the result of the assessment, the assessment team confirms that the proposed standardized baseline is calculated without material misstatements in a conservative and appropriate manner. TÜV NORD JI/CDM CP herewith confirms that the proposed SB can be applied for CDM GHG abatement projects as follows:

Operating margin (in t CO_2/MWh)	0.9899
Build margin (in t CO_2/MWh)	0.8354
Combined margin (in t CO_2/MWh)	
Wind and solar power generation project activities for the first crediting period and for subsequent crediting periods w_{OM} (0.75) and w_{BM} 0.25	0.9513
All other projects for the first crediting period w_{OM} (0.75) and w_{BM} 0.25	0.9126
All other projects for the second and third crediting period (w_{OM} (0.75) and w_{BM} 0.25)	0.8740

Essen, 2017-04-27

Evgeni, Sud

TÜV NORD JI/CDM Certification Program

Assessment Team Leader

Essen, 2017-04-27

Winter, Rainer

TÜV NORD JI/CDM Certification Program

Final Approval

7. REFERENCES

Table 7-1: Documents provided by the project participant(s)

Reference	Document
/**DPP**/	Data Delivery Protocol
/**SB1**/	Calculation of the Emission Factor of the Electricity System of Southern Africa, version 1.0 dated 13.04.2017 Calculation of the Emission Factor of the Electricity System of Southern Africa, version 1.1 dated 04.05.2017
/**GUIDE**/	Guidelines for the Establishment of Sector Specific Standardized Baselines (EB65 Annex 23) Guidelines for the QA and QC of Data used in the establishment of Standardized Baselines (EB66 Annex 49)
/**PPT**/	Information about Southern African Power Pool (SAPP)
/**QC**/	Quality Control Report
/**SAPS1**/	Spalding-Fecher, R., Sentala,M., Yamba, F., Lukwesa, B., Himunzowa, G., Heaps, C., Chapman, A., Mahumane, G., Tembo, B., Nyambe, I., 2016, Electricity supply and demand scenarios for the Southern African power pool, Energy Policy, Elsevier
/**SAPS2**/	Miketa, A., Merven, B., 2013. Southern African Power Pool: Planning and Prospects for Renewable Energy. IRENA. International Renewable Energy Agency, Abu Dhabi
/**XLS**/	• Calculation spreadsheet provided on 16.03.2017 “GEF 2017-03-16 LOCE final draft.xls”

Table 7-2: Background investigation and assessment documents

Reference	Document
/**AMS**/	• Standardized baseline: Grid emission factor for the Southern African power pool ASB0001 Version 25.04.2017 rev.1.1.
/**CPM**/	TÜV NORD JI / CDM CP Manual (incl. CP procedures and forms)
/**GUIDE**/	• Guideline “Quality assurance and quality control of data used in the establishment of standardized baselines” (EB79, Annex 07) version 2.0 • Guidelines for the establishment of sector specific standardized baselines” (EB65 Annex 23) version 2.0

Reference	Document
/**Int**/	Interview notices taken during interviews with respective personnel
/**IPCC**/	1. 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book 2. 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book
/**KP**/	Kyoto Protocol (1997)
/**MA**/	Decision 3/CMP. 1 (Marrakesh – Accords)
/**PCP**/	Procedure version 3.1 and version 4.0
/**PROC1**/	Procedure for the submission and consideration of Standardized Baselines (EB68 Annex 32)
/**PROC2**/	Development, revision, clarification and update of standardized baselines (EB63 Annex 28) Development, revision, clarification and update of standardized baselines (EB84 Annex 10)
/**PS**/	CDM Project Standard (Version 9.0)
/**Tool**/	"Tool to calculate the emission factor for an electricity system" (Version 5.0)
/**VVS**/	CDM Validation and Verification Standard (Version 09.0)

Table 7-3: Websites used

Reference	Link	Organisation
/**sapp**/	www.sapp.co.zw	Southern African Power Pool
/**cd4cdm**/	www.cd4cdm.org	UNEP Riso Centre
/**unfccc**/	http://cdm.unfccc.int	UNFCCC
/**ipcc**/	www.ipcc-nggip.iges.or.jp	IPCC publications

Table 7-4: List of interviewed persons

Reference	MoI[1]		Name	Organisation / Function
/**IM01**/	V	☒ Mr. ☐ Ms.	Martin Burian	GFA Consulting Group / Senior Advisor and Team Leader
/**IM01**/	T	☒ Mr. ☐ Ms.	Sydney Zimba	South African Power Pool Coordination Center/ Operations Engineer
/**IM02**/	E	☒ Mr. ☐ Ms.	Dr. Peter Zhou (),	EECG, Botswana / ESKOM Operations Engineer
/**IM02**/	E	☐ Mr. ☒ Ms.	Francis Masawi	EiL, Zimbabwe / Operations Engineer

[1)] Means of Interview: (**T**elephone, **E**-Mail, **V**isit)

ANNEX

A1: Assessment Protocol

A2: Statements of Competence of involved Personnel

ANNEX 1: ASSESSMENT PROTOCOL

Table A-1: Assessment Checklist

Checklist Item (incl. guidance for the assessment team)	**Refe-rence**	**Assessment Team Comments** (Means and results of assessment)	**Draft Concl.**	**Final Concl.**
Description of the Standardized baseline				
Assess if the description of the standardized baseline is correct and accurate *a) host country,* *b) level of aggregation,* *c) measure (s),* *d) output and sector (s)* *(EB65, Annex 23) §§8, 15*	/SB1/	Description: The standardized baseline has been correctly and accurately described. The relevant electricity system is located in nine Non-Annex I counties. These are the Botswana, Democratic Republic of Congo (DRC), Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia and Zimbabwe. The Project Electricity System (PES) is defined as the electricity system shared by the nine member countries. The level of aggregation, measures applicable and sector and output all defined in the updated Approved Standardized Baseline ASB0001. *Assessor's action:* The draft SB reports have been reviewed *Conclusion:* The SBs have been correctly and accurately described.	OK	Ok
A. QA/QC System				
A.1. Description of the QA/QCSystem	/SB1/ /SB2/	*Description:* The responsibilities are clear and it is clear which entities and		OK

Checklist Item (incl. guidance for the assessment team)	**Refe-rence**	**Assessment Team Comments** (Means and results of assessment)	**Draft Concl.**	**Final Concl.**
(GUIDE, §27) *As part of the QA system, the DOE should check whether the QA/QC system is put in place and assess the QA/QC system against the data quality objectives established in this document. It also includes assessing whether the QA/QC system has been implemented as designed.*	/QC/ /IM01/	stakeholders are to be addressed to obtain required information and/or data. For further details please refer to the assessment of the QA/QC system in the section 5.6 of this report. *Assessor's action:* DOE has assessed the same by check of draft QC report, SB documents, and esp. based on interview with related personnel responsible and/or their superiors. *Conclusion:* DOE is confident that the QA/QC system complies with UNFCCC requirements with respect to System availability, Conformity, Traceability, Security and Error tolerance. For further details please refer to the assessment of the QA/QC system in the section 5.6 of this report.		
A.1. Elements of the QA/QC System				
(a) System availability – identify whether a "standardized" data system (collection, consolidation and maintenance) is currently in place and a procedure for reporting activities conducted as part of the QC system has been developed and implemented;	/SB1/ /QC/ /IM01/	Description: A "standardized" data system is in place. Data collection, consolidation and maintenance is follows the provisions of the QA/QC system specified in the SAPP Grid emission factor report. The SAPP Grid emission factor report defines stepwise approach to collect data by using standardized data report as well procedures and responsibilities for data consolidation, crosscheck and final calculation of the grid emission factor. The same has been duly implemented and conducted within the actual SAPP Grid EF determination.		OK

Checklist Item (incl. guidance for the assessment team)	**Refe-rence**	**Assessment Team Comments** (Means and results of assessment)	**Draft Concl.**	**Final Concl.**
		Assessor's action: DOE has assessed the same by check of draft QC report, SB documents, and esp. based on interview with related personnel responsible and/or their superiors. *Conclusion:* DOE is confident that the QA/QC system complies with UNFCCC requirements with respect to System availability, Conformity, Traceability, Security and Error tolerance. For further details please refer to the assessment of the QA/QC system in the section 5.6 of this report.		
(b) Conformity - assess whether the QA/QC system, the procedures and all the approaches to develop the datasets met the data quality objectives. In particular, DOEs should assess whether a conservative approach has been applied in a consistent manner; whether the data delivery protocol was consistent with the data template if applicable; and whether the transparency was ensured, based on the public consultation report and the QC report. DOEs should check whether the QA/QC procedures were: *(i) developed in accordance with the QA/QC Guidelines; and* *(ii) effectively implemented (e.g. met the data quality objectives);*	/SB1/ /QC/ /IM01/	*Description:* The QA/QC protocol ensures that data quality objectives are met. Where there were data gaps, conservative estimates based on existing data and were consistently applied. The datasets were acquired transparently and cross-checked by the assessment team. This relates mainly to the cases where power utilities didn't provide information about the fuel consumption and its net calorific value. Conservative estimates have been done in accordance with the respective provisions of the "tool"/Tool/. *Assessor's action:* DOE has assessed the same by check of draft QC report, SB documents, and esp. based on interview with related personnel responsible and/or their superiors. *Conclusion:* DOE is confident that the QA/QC system complies with		OK

Checklist Item (incl. guidance for the assessment team)	**Refe-rence**	**Assessment Team Comments** (Means and results of assessment)	**Draft Concl.**	**Final Concl.**
		UNFCCC requirements		
(c) Traceability – check whether all data and information relating to the source of datasets and procedures for standardized baselines were clearly documented;	/SB1/ /QC/ /IM01/	QC report states related documents to be used as crosscheck of datasets.		OK
(d) Responsiveness – does the data delivery protocol meet the provisions of the QA/QC guidelines? Was the communication of the DNA with data providers timely and more efficient?	/DDP/ /XLS/ /IM01/	*Description:* The data delivery protocol (in excel) captures all required data to ensure quality, correctness, completeness, and relevance in line with provisions of the QA/QC guidelines (EB66, Annex 49).	OK	OK
(e) Adaptability – was the system modified in order to address the major issues identified. Does the modified system meet the data quality objectives and the provisions of the QA/QC guidelines?	/SB1/ /QC/ /IM01/	Data is collected from the power utilities using a uniform data request protocol. The system modified is able to address the major issues and specific data requirements. A standardized data collection system is in place and procedures outlined in the data delivery template. The template is assessed as complete and consistent in the acquisition of relevant, complete, and current data.		OK
(f) Security – check whether a security system for data management is in place and has operated effectively. Identify whether any issues related to security occurred;	/SB1/ /IM01/	A security system for data management is in place in the SAPP office. All data collected is saved electronically and paper reports are filed away securely. The SAPP office did not show any possible lapses in terms of data protection. No incidents related to data security have been reported.		OK

Checklist Item (incl. guidance for the assessment team)	**Refe-rence**	**Assessment Team Comments** (Means and results of assessment)	**Draft Concl.**	**Final Concl.**
(g) Error tolerance – check whether DNAs planned to minimize errors and established and implemented procedures to identify and correct errors proactively.	/SB1/ /IM01/	The SAPP, through the QA/QC system has sought to minimize errors and has established procedures to identify and correct errors. These procedures as outlined in the reports have been assessed to be sufficient.		OK
B. Algorithms and/or formulae used to determine the SB *It is assessed whether the steps taken and the equations and parameters applied in the SB to calculate the standardized baseline comply with the requirements of the selected methodology including applicable tool(s).*				
a) Are the equations applied correctly according to the applied/or proposed new CDM methodology?	/SB1/ /DPP/ /QC/ /Tool/ /IM01/ /XLS/	Description: The calculation of the grid emission factor follows the requirements of the UNFCCC's "Tool to calculate the emission factor for an electricity system" (Version 5.0), hereafter referred to as the "tool"). The calculation is performed in a dedicated excel file that was developed by the Institute for Global Environmental Strategies (IGES). *Assessor's action:* The Version 5.0 of the UNFCCC's "Tool to calculate the emission factor for an electricity system" is the most recent version. The stepwise approach specified in the "tool" has been duly applied within the calculation of the SAPP grid emission factor. This could be confirmed by comparing the specific provisions of the Tool with the steps described in the SB report/SB1/ and related calculation tool/tool/. In particular Within the STEP 1 the Relevant Electricity System was duly	~~CAR 1~~ ~~CAR 2~~	OK

Checklist Item (incl. guidance for the assessment team)	**Refe-rence**	**Assessment Team Comments** (Means and results of assessment)	**Draft Concl.**	**Final Concl.**
		identified as the electricity grid shared by the nine member countries. The information about the operational capacity of tie lines, as well as the current electricity trades between SAPP member countries was checked and it could be confirmed that no transmission constraints exist. Within the STEP 2 it was duly chosen not to include off-grid power plants. This is appropriate and in line with Tools provisions. Within the Step 3 simple operating margin was selected. The selection is appropriate because share of Low-Cost/Must-Runs (MR) is below 50%. This could be evidenced based on the information about the electricity generation of the Low-Cost/Must-Runs of the five most recent years. Data vintage, selection of the plants as well as the calculation was checked and found appropriate. Within the STEP 4 the operating margin emission factor has been duly calculated. The calculation approach in the excel file was checked and found appropriate. The applied data with respect to the energy generation, fuel consumption, NCVs, has been crosschecked with the original data sourced from the particular power plants and found consistent. In case of data gaps a conservative approach has been applied in accordance with the specific provisions of the “tool”. The SB report provides a clear explanation to the applied calculation method and their compliance with tools provisions. Within the STEP 5 the group of power units to be Included in the Build Margin has been duly identified. The selection of the power units is clearly described and visualized in the SB report.		

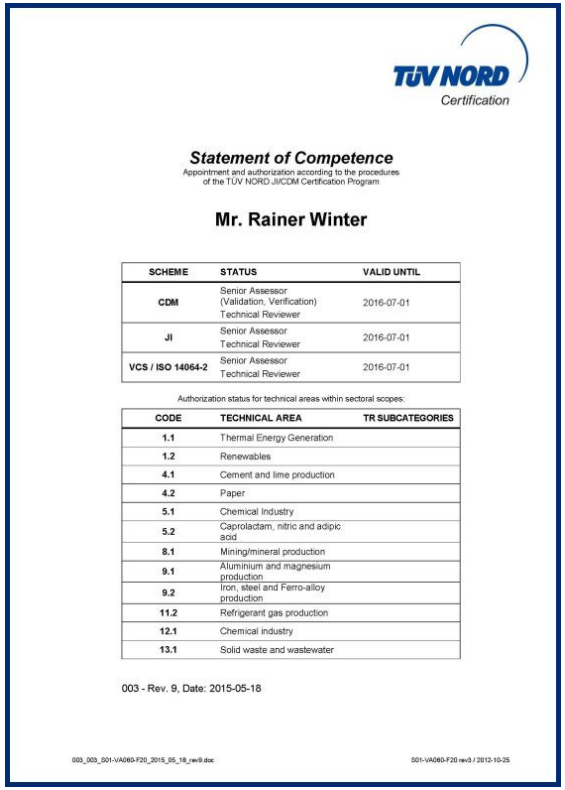
Checklist Item (incl. guidance for the assessment team)	**Refe-rence**	**Assessment Team Comments** (Means and results of assessment)	**Draft Concl.**	**Final Concl.**
		The selection has been checked and found in line with the tool requirements. Within the Step 6 Build margin has been correctly calculated. The calculation performed in the excel file has been checked and found appropriate. The applied formulae are in line with the tool requirements. Finally within the STEP 7 the Combined Margin Emissions Factor has been duly determined based on the OM/BM and respective weights. The weights have been checked and found to be in line with the weights defined by the tool for respective project types. As a result it could be confirmed that the combined margin emissions factors for different project types as presented in the SB report and duly calculated. *Conclusion:* Calculations correct but based on incomplete data. Finding CAR 1 and CAR 2 have been raised and successfully closed.		
b) *Have conservative assumptions been used when calculating the standardized baselines?*	/SB1/ /DPP/ /QC/ /Tool/ /IM01/ /XLS/	Description: Please see above *Assessor's action:* *Conclusion:* CAR 1 and 2 has been raised	~~CAR 1~~ ~~CAR 2~~	OK

Checklist Item (incl. guidance for the assessment team)	**Refe-rence**	**Assessment Team Comments** (Means and results of assessment)	**Draft Concl.**	**Final Concl.**
c) *Are all data sources and assumptions appropriate and conservative estimation of the standardizedbaseline (s)?* *How have data gaps been addressed?* *Check if the correct data vintage has been selected for the sector* *EB65 Annex 23, Appendix 1*	/SB1/ /DPP/ /QC/ /Tool/ /IM01/ /XLS/	Description: Please refer above *Assessor's action:* *Conclusion:* CAR 1 and 2 has been raised	~~CAR 2~~	OK
d) *Are all data sources appropriately referenced?*	/SB1/ /DPP/ /QC/ /Tool/ /IM01/ /XLS/	Description: All data sources as referred to in the SB has been correctly referenced or provided. *Assessor's action:* The SBs have been assessed *Conclusion:* CAR 1 and 2 has been raised	~~CAR 1~~ ~~CAR 2~~	OK
B.1. Additionality				
a) *Is the additionally criteria correctly demonstrated?* *(EB65, Annex 23) §§§13, 14, 15, Section IV.*	/SB1/ /IM01/	Description: The provided study is related solely to the calculation of the Emission Factor of the Electricity System of Southern Africa. *Assessor's action:* The study the calculation of the Emission Factor of the Electricity System of Southern Africa including the Excel	OK	OK

Checklist Item (incl. guidance for the assessment team)	**Refe-rence**	**Assessment Team Comments** (Means and results of assessment)	**Draft Concl.**	**Final Concl.**
		calculation spreadsheet have been checked *Conclusion:* Additionality criteria are not relevant.		
B.2. Sampling				
Check whether the client has applied a sampling approach to determine the calculated values (as per section D.2 above). *If this is the case, please provide an assessment whether the PPs have correctly and sufficiently described the implemented sampling plan including* *a) Description of the implemented sampling design* *b) Collected data* *c) Analysis of collected data* *Demonstration on whether the required confidence/precision has been met.*	/SB1/ /SB2/ /QC/ /IM01/	☒ No sampling approach has been used by the PP to determine the monitored parameters **OR**. ☐ A sampling approach has been taken for the following monitored parameter: ***Parameter:*** *Description:* *Assessor´s action:* *Conclusion:*	N/A	OK
b) Sampling during Assessment *In case the assessment team has applied a sampling approach in the course of the validation assessment the approach shall be described for each parameter.*	/SB1/ /SB2/ /QC/ /IM01/	☒ No sampling approach has been used by the VT to verify the monitored parameters **OR**. ☐ A sampling approach has been applied by the VT for the following monitored parameter: ***Parameter:*** *Description:*	N/A	OK

Checklist Item (incl. guidance for the assessment team)	**Refe-rence**	**Assessment Team Comments** (Means and results of assessment)	**Draft Concl.**	**Final Concl.**
		Conclusion:		

ANNEX 3: STATEMENTS OF COMPETENCE OF INVOLVED PERSONNEL



TÜV NORD Certification

Statement of Competence

Appointment and authorization according to the procedures of the TÜV NORD JI/CDM Certification Program

Mr. Rainer Winter

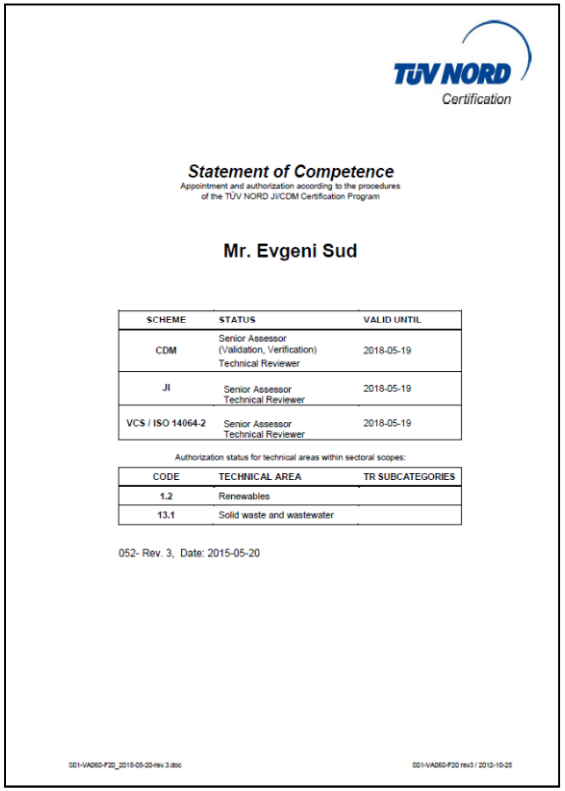
SCHEME	STATUS	VALID UNTIL
CDM	Senior Assessor (Validation, Verification) Technical Reviewer	2016-07-01
JI	Senior Assessor Technical Reviewer	2016-07-01
VCS / ISO 14064-2	Senior Assessor Technical Reviewer	2016-07-01

Authorization status for technical areas within sectoral scopes:

CODE	TECHNICAL AREA	TR SUBCATEGORIES
1.1	Thermal Energy Generation	
1.2	Renewables	
4.1	Cement and lime production	
4.2	Paper	
5.1	Chemical Industry	
5.2	Caprolactam, nitric and adipic acid	
8.1	Mining/mineral production	
9.1	Aluminium and magnesium production	
9.2	Iron, steel and Ferro-alloy production	
11.2	Refrigerant gas production	
12.1	Chemical industry	
13.1	Solid waste and wastewater	

003 - Rev. 9, Date: 2015-05-18

003_003_S01-VA060-F20_2015_05_18_rev9.doc S01-VA060-F20 rev3 / 2012-10-25



TÜV NORD Certification

Statement of Competence

Appointment and authorization according to the procedures of the TÜV NORD JI/CDM Certification Program

Mr. Evgeni Sud

SCHEME	STATUS	VALID UNTIL
CDM	Senior Assessor (Validation, Verification) Technical Reviewer	2018-05-19
JI	Senior Assessor Technical Reviewer	2018-05-19
VCS / ISO 14064-2	Senior Assessor Technical Reviewer	2018-05-19

Authorization status for technical areas within sectoral scopes:

CODE	TECHNICAL AREA	TR SUBCATEGORIES
1.2	Renewables	
13.1	Solid waste and wastewater	

052- Rev. 3, Date: 2015-05-20

S01-VA060-F20_2015-05-20-rev.3.doc S01-VA060-F20 rev3 / 2012-10-25

TÜV NORD

CERTIFICATE OF APPOINTMENT

Mr. Sergej Friesen

born on 1980-02-24

satisfies the requirements as specified in the TÜV NORD JI/CDM CP directives and is hereby appointed as

TÜV NORD JI/CDM Senior Assessor

The present appointment will terminate on 2017-04-27

Certification registration No. 14 01 01- 050

Essen, 2014-04-28

Head of TÜV NORD JI/CDM Certification Program of TÜV NORD CERT GmbH