VERIFICATION REPORT

for the CDM Project Activity

Bujagali Hydropower Project

in

Uganda

Report No. 01 99791050 77275

Version 1.2, 2014-09-01

Designated Operational Entity (DOE)

TÜV Rheinland (China) Ltd

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I. Project data:

Project title:	Bujagali Hydropower Project		Report No.: 01 997 9105077275	
Registration No. / Date:	4217 / 7th October 2011		Current revision No.: 1.2	
Monitoring period:	01/12/2011 - 31/10/2013 including both days		Date of current revision: 2014-09-01	
Methodology:	ACM0002, version 12		Date of first issue: 2014-07-30	
Publication of MR:	The monitoring report (version 0.1, 13/11/2013) was published at UNFCCC website on 14/11/2013			
Average emission reductions:	**Estimated**	1,648,162 tCO_2e from 01/12/2011 - 31/10/2013 including both days based on annual emission reductions as indicated in the approved revised PDD (version 2.1, dated 05/03/2014)	**Verified for CP1:**	635,939 tCO_2e
			Verified for CP2:	763,464 tCO_2e
GHG reducing measure/technology:	Electricity generation by renewable hydro energy resource			

Party	Project participants	Party considered a project participant	Contract party
(Host) Republic of Uganda	Bujagali Energy Limited (Private) Government of Uganda, Ministry of Energy and Mineral Development (Public)	Yes	☒
The Netherlands		No	☐

II. Verification Team:

Verification Team			Role									
Full name	**Affiliation TÜV Rheinland**	**Appointed for Sectoral Scopes (Technical Areas)**	Team leader	Acting Team Leader	Local Expert	Team Member (Auditor)	Technical Expert	Acting Tech. Expert	Trainee Auditor	Technical Reviewer	Expert to TR	Trainee TR
Mr. Norbert Heidelmann[1]	Germany	1.2; 13.1; 13.2; 15.2	X									
Ms. Andrea Nuesse[1]	Germany	N/A							X			
Mr. Walter Tang[1]	China	1; 2; 3; 4; 13								X		
Mr. You CUI[2]	Germany	1.2; 13.1	X									
Mr. Yuriy Lozynskyy[2]	Germany	1.2; 7.1; 13.1				X						
Ms. Denitsa Gaydarova-Itrib[2]	Germany	N/A							X			

Verification Phases	Verification Status
☒ Desk Review ☒ Follow up interviews ☒ Resolution of outstanding issues	☒ Corrective Actions / Clarifications Requested ☒ Full Approval and Submission for Issuance ☐ Rejected

III. Verification Report:

Final approval	Released	Distribution

[1] Final verification team
[2] Original verification team

☒ **Date: 2014-09-15**	**By: Mr. Henri Phan**	☐ No distribution without permission from the Client or responsible organizational unit ☒ Unrestricted distribution

Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CDM PCP	Clean Development Mechanism Project Cycle Procedure
CDM PS	Clean Development Mechanism Project Standard
CDM VVS	CDM Validation and Verification Standard
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CH_4	Methane
CL	Clarification request
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
CP	Commitment Period
DNA	Designated National Authority
DOE	Designated Operational Entity
FAR	Forward Action Request
GHG	Greenhouse Gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
MR	Monitoring Report

Verification opinion — summary

The verification team assigned by the DOE - TÜV Rheinland (China) Ltd. concludes that the CDM Project Activity "Bujagali Hydropower Project" in the Republic of Uganda, as described in the approved revised PDD (version 2.1, dated 05/03/2014) and 1st period monitoring report (version 1.1, dated 26/08/2014), meets all relevant requirements of the UNFCCC for CDM project activities including article 12 of the Kyoto Protocol, the modalities and procedures for CDM (Marrakesh Accords) and the subsequent decisions by the COP/MOP and CDM Executive Board.

Verification methodology and process

The verification has been performed as described in the VVS version 07.0 and constitutes the following steps:

- Publication of the MR on the UNFCCC website (14/11/2013)
- Desk review of the MR and the relevant documents
- On-site assessment (05-07/12/2013)
- Issuance of Verification Report

The project activity was correctly implemented according to the selected monitoring methodology and monitoring plan. The monitoring equipment was installed, calibrated and maintained in a proper manner. The collected monitoring data allowed the verification of the amount of achieved GHG emission reductions. The DOE therefore is pleased to issue a positive verification opinion expressed in the attached Certification Statement.

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1. Introduction

Bujagali Energy Limited has commissioned the DOE - TÜV Rheinland (China) Ltd. to perform a verification of the CDM Project Activity "Bujagali Hydropower Project" in the Republic of Uganda (hereafter "project activity"). This report summarizes the findings of the verification of the project, performed on the basis of paragraph 62 of the CDM modalities and procedures as well as the criteria ensuring consistent project operations, monitoring and reporting and the subsequent decisions by the CDM Executive Board.
Verification is required for all registered CDM project activities intending to confirm their achieved emission reductions and proceed with request for issuance of CERs. This report contains the findings from the verification and a certification statement for the certified emission reductions.

1.1 Objective

Verification is the periodic independent review and ex post determination by a Designated Operational Entity (DOE) of both quantitative and qualitative information of the monitored reductions in GHG emissions that have occurred as a result of the registered CDM project activity during a defined monitoring period.
Certification is the written assurance by a DOE that, during a specific period in time, a project activity achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the "Bujagali Hydropower Project" in the Republic of Uganda for the period from 01/12/2011 to 31/10/2013 including both days.

The purpose of verification is to review the monitoring results, verify that the monitoring methodology was implemented according to the monitoring plan and that the monitoring data, used to confirm the reductions in anthropogenic emissions by sources, is sufficient, definitive and presented in a concise and transparent manner.
In particular, the monitoring plan, the monitoring report and the project's compliance with relevant UNFCCC and host Party criteria are verified in order to confirm that the project has been implemented in accordance with the previously registered design, that the monitoring plan is in compliance with the approved revised PDD and approved monitoring methodology, and that conservative assumptions, as documented, have been applied in the process.

1.2 Scope

The scope of the verification is:

- To verify that the actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan.
- To evaluate the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement.
- To verify that reported GHG emission data is sufficiently supported by evidence.

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified.
The verification comprises a review of the monitoring report over the monitoring period from 01/12/2011 to 31/10/2013 including both days. The verification will be based on the approved revised PDD with regards to the monitoring parameters and monitoring plan, on the emission reduction calculation spreadsheet, on the applicable monitoring methodology and all other related evidence provided by the project participant.

On-site visit and stakeholders interviews are also performed as part of the verification process.

2. Methodology

The verification consists of the following four phases:

1. Completeness check and webhost of the monitoring report for public commenting;
2. Desk review of the monitoring plan, monitoring report, monitoring methodology, project design document, applicable tools in particular attention to the frequency of measurements, quality of metering equipment including calibration requirements, QA/QC procedures and other relevant documents;
3. On-site visit (including follow-up interviews with project stakeholders, when deemed necessary). The on-site assignment includes the following:
   - An assessment of the implementation and operation of the project activity with respect to the registered PDD or approved revised PDD;
   - Review of information flows for generating, aggregating and reporting the monitoring parameters;
   - Interview with relevant personals to determine whether the operational and data collection procedures are implemented and in accordance with monitoring plan of the approved revised PDD;
   - Cross check of information and data provided in the monitoring report with plant logbooks, inventories, purchase records or similar data sources;
   - Check of monitoring equipment, calibration frequency and monitoring practice in-line with methodology and approved revised PDD;
   - Review of assumptions made in calculating the emission reduction;
   - Implementation of QA/QC procedure in-line with the approved revised PDD and methodology requirement.
4. Resolution of outstanding issues and the issuance of the final verification report and certification statement.

The following sections outline each step in more detail.

2.1 Desk review

The following table outlines the documentation reviewed during the verification:

No.	*Timeline*	*Reference Document*
/DOC1/	25/11/2011	Approved baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 12
/DOC2/	05/11/2013	Standard monitoring report format issued by EB, version 03.2
/DOC3/	01/06/2014	CDM Validation and Verification Standard, version 07.0
/DOC4/	01/06/2014	CDM project standard, version 07.0
/DOC5/	01/06/2014	CDM Project Cycle Procedure, version 07.0
/DOC6/	06/10/2011	Registered PDD, Version 2.0 (Registration No. 4217)
/DOC7/	06/10/2011	Registered Validation Report (validated by ERM CVS, Report No. 1883.v1)
/DOC8/	22/06/2011	LoA issued by Ugandan DNA
/DOC9/	06/12/2012	LoA issued by Netherlands DNA
/DOC10/	12/2005	Signed PPA
/DOC11/	12/2005	PPA: Annex A – Development Plan
/DOC12/	12/2011-10/2013	Data records (SCADA) measured by the electric meters: • G1 Main, G2 Main, G3 Main, G4 Main, G5 Main • G1 Check, G2 Check, G3 Check, G4 Check, G5 Check
/DOC13/	12/2011-10/2013	Monthly invoice (ECB) of electricity sales to the grid issued by the project owner
/DOC14/	12/10/2009	Factory acceptance test for main and backup meters

No.	Timeline	Reference Document
/DOC15/	03/2009	Technical note for the metering equipment ION7550
/DOC16/	08/05/2009	Certificate of Compliance and Calibration for G1 Main
/DOC17/	08/05/2009	Certificate of Compliance and Calibration for G2 Main
/DOC18/	13/05/2009	Certificate of Compliance and Calibration for G3 Main
/DOC19/	08/05/2009	Certificate of Compliance and Calibration for G4 Main
/DOC20/	07/05/2009	Certificate of Compliance and Calibration for G5 Main
/DOC21/	07/05/2009	Certificate of Compliance and Calibration for G1 Check
/DOC22/	08/05/2009	Certificate of Compliance and Calibration for G2 Check
/DOC23/	13/05/2009	Certificate of Compliance and Calibration for G3 Check
/DOC24/	07/05/2009	Certificate of Compliance and Calibration for G4 Check
/DOC25/	08/05/2009	Certificate of Compliance and Calibration for G5 Check
/DOC26/	08/04/2011	Commissioning test certificate (switchyard & meters)
/DOC27/	23/07/2012	Unit Acceptance Letters
/DOC28/	07/12/2013	Overview list of all available O&M manuals
/DOC29/	2011/2012	Training schedule 2011/2012
/DOC30/	2011	Sample attendance sheets

No.	Timeline	Reference Document
/DOC31/	06/12/2013	Name plate of generator (photo)
/DOC32/	06/12/2013	Name plate of diesel generator (switchyard)
/DOC33/	06/12/2013	Name plate of diesel generator (power house)
/DOC34/	07/12/2013	Screenshot of diesel generator operations duration
/DOC35/	13/11/2013	Monitoring Report for 1st monitoring period, version 0.1
/DOC36/	-	Spreadsheet of emission reduction calculation
/DOC37/	12/2006	Bujagali Hydropower Project, Social and Environmental Assessment Main Report (for water levels and surface area)
/DOC38/	05/03/2014	Approved Revised PDD (version 2.1, dated 05/03/2014)
/DOC39/	26/08/2014	Monitoring Report for 1st monitoring period, version 1.1

2.2 On-site visit and follow-up interviews with project stakeholders

TÜV Rheinland verification team carried out an on-site visit on 05 & 06/12/2013 and performed interviews with the project representatives and stakeholders. Prior to the interview salient points to be discussed were planned. The date of interview, interviewee and points discussed are given in the following table:

No.	*Date*	*Name*	*Organization*	*Topic*
/I1/	05/12/2013	Mr. Francis Mwangi	Technical Manager, Bujagali Energy Ltd	- Information regarding actual implementation of the project activity - Documentation of meter readings - Issuance of invoice to the grid company - QA/QC procedure of data review and transfer - Calibration of the electric meters - Monitoring management - Emergency procedure and O&M manuals - Date of commissioning of the power plant (individual units) - Training on operation and maintenance
/I2/	05/12/2013	Mr. Edward Onage	Operations Manager, O&M Energy Ltd	
/I3/	06/12/2013	Mr. Rions Odock	Technical Attendant, Uganda Electricity Transmission Company Limited (UETCL)	- Monitoring management - QA/QC procedure
/I4/	06/12/2013	Mr. Reynaldo Gront	Operations Manager, O&M Energy Ltd	- Monitoring system of net electricity supplied to the grid - Automated data collection and record system of the grid company - Back-up fuel use (diesel generators)
/I5/	06/12/2013	Mr. John Berry	General Manager, Bujagali Energy Ltd	- Background of project development and implementation - Power Purchase Agreement - Installed capacity of power plant
/I6/	06/12/2013	Mr. Valentine Katabira	Managing Director, Uganda Electricity Transmission Company Limited (UETCL)	- Monitoring management - QA/QC procedure

No.	Date	Name	Organization	Topic
/I7/	05-06/12/ 2013	Mr. Bamshad Houshyani	Climate Focus B.V.	- Emission reduction calculations - Documentation of meter readings

The verification team considered the information obtained through these interviews, along with the on-site observation, objective evidence collections, data generation and recording analysis to arrive at the final verification opinion.

2.3 Resolution of outstanding issues

The objective of this phase of the verification is to resolve any outstanding issues which have to be clarified prior to final DOE's conclusions on the project implementation, monitoring practices and achieved emission reductions. In order to ensure transparency a verification protocol is completed for the project activity. The protocol shows the criteria (requirements), means of verification and resulting statements on the verification of the actual project activity against the identified criteria in a transparent manner.

The verification protocol serves the following purposes:

- It organises in a table form, details and clarifies the requirements, which CDM project is expected to meet;
- It ensures a transparent verification process where the DOE will document how a particular requirement has been verified and the result of the verification.

The verification protocol consists of three tables. Table 1 (verification protocol) reflects the verification requirements and reference to the materials used to verify the project activity against those requirements, as well as means of verification, reference to Table 2 (CAR/CL list) and preliminary and final opinion of the DOE on every particular requirement.
Table 3 reflects the any carry forward actions initiated by the verification team if the monitoring and reporting require attention and/or adjustment for the next verification period.
The completed verification protocol for this project is enclosed in Appendix A to this report.

Findings during the verification can be interpreted as a non-compliance with CDM criteria or a risk to the compliance. Corrective action requests (CARs) are raised in case:

(a) Non-conformities with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;
(b) Modifications to the implementation, operation and monitoring of the registered project activity have not been sufficiently documented by the project participants;
(c) Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
(d) Issues identified in a FAR (forward action request) during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.

Requests for clarification (CLs) are raised, if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

2.4 Internal quality control

The final verification report has passed a technical review before requesting issuance of the project activity. The technical review was performed by a technical reviewer qualified in accordance with TÜV Rheinland's qualification scheme for CDM validation and verification that meets the criteria of EB guidelines for qualification.

2.5 Verification Team

Before the assessment begins, members of the verification team are appointed to ensure the necessary expertise is available in the relevant technical area(s), sectoral scope(s) and relevant host country experience including local language ability for evaluating the CDM verification activity. The qualification of the team is as per the criteria defined by the EB guidelines for qualification.

Verification Team			Type of Involvement						
Full name	**Affiliation TÜV Rheinland**	**Appointed for Sectoral Scopes (Technical Areas)**	Supervising the work	Desk review	Site Visit + Interview	Report and protocol Writing	Technical Expert Input	Reporting Support	Technical Reviewer
Mr. Norbert Heidelmann[3]	Germany	1.2; 13.1; 13.2; 15.2	X				X		
Ms. Andrea Nuesse[3]	Germany	N/A		X	X	X			
Mr. Walter Tang[3]	China	1; 2; 3; 4; 13							X
Mr. You CUI[4]	Germany	1.2; 13.1	X	X	X		X		
Mr. Yuriy Lozynskyy[4]	Germany	1.2; 7.1; 13.1						X	
Ms. Denitsa Gaydarova-Itrib[4]	Germany	N/A		X					

3. Verification findings

The findings of the verification are described in the following sections. The verification criteria (requirements), the means of verification and the results of the verification are documented in detail in the verification protocol in Appendix A.

3.1 Project implementation

3.1.1 The implementation of the project activity

Project Participants:	- Bujagali Energy Limited - Government of Uganda Ministry of Energy and Mineral Development
Project Parties:	- Republic of Uganda (Host Party)
Title of project activity:	Bujagali Hydropower Project
UNFCCC registration No:	4217
Baseline and monitoring methodology:	Approved baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 12
Project Type:	Renewable energy

[3] Final verification team
[4] Original verification team

Project Scale:	Large Scale
Location of the project activity:	The project is located on the Victoria Nile in the Republic of Uganda, 8 km downstream from the city of Jinja. The geographical coordinates are 0.501322° N and 33.13895° E.
Project's crediting period:	01/12/2011 – 30/11/2018
Total Duration of the project:	7 years (renewal)
Period verified in this verification:	01/12/2011 – 31/10/2013

As part of the site visit the verification team was able to confirm that the project implementation is in accordance with the project description contained in approved revised PDD (version 2.1, revised 05/03/2014). The verification took cognizance of § 238, 239 & 240 of the CDM Project Standard.

Herewith, the verification team summarizes *major* changes between webhosted Monitoring Report and final version of Monitoring Report for submission as follows:

Subject	Webhosted Monitoring Report (MR)	Correction to webhosted MR in the final MR submission for issuance with DOE assessment and reason of acceptance.
Consistency		
MR (project title / participants involved / project location / reference numbers / report date and version etc.)	MR, version 0.1, 13/11/2013	MR, version 1.1, 26/08/2014
Methodologies (title and version numbers, PDD and its version)	Registered PDD, version 2.0, 06/10/2011	Approved revised PDD, version 2.1, 05/03/2014
CER calculations (formula applied / amount of emission reduction)	1,400,523 metric tonnes CO_2 equivalent	1,399,403 metric tonnes CO_2 equivalent
Registration date, consistent / logical sign -off dates	N/A	N/A
Monitoring (period dates / parameters / frequency)	Installed capacity: 250 MW	Installed capacity: 263.5 MW
Crediting period (type / start date)	N/A	N/A
Please refer to Appendix A of this report for details of each change between webhosted MR and the final MR for submission. The verification team has carried out the verification process based on the Webhosted MR and raised CAR(s) against the project by issuing the verification protocol. With the updated information and corrections done on final MR, the PP has addressed all the		

CAR(s) that were raised by the verification team. It is concluded that the verification team has reviewed the project in line with the VVS (version 07.0) and all the evidence, corrections, justifications and updating done on the final MR with respect to CARs raised are accepted and closed by the verification team, issuing the positive verification opinion.

TÜV Rheinland verification team considers the project description of the project contained in the approved revised PDD (/DOC38/) to be complete and accurate. The approved revised PDD (/DOC38/) complies with the relevant methodology, tools, forms and guidance at the time of PDD submission for registration.

3.1.2 The actual operation of the CDM project activity

<table>
<tr><td>Project physical features (technology, project equipment, monitoring and metering equipment)</td><td>By means of desk review and on-site observation, the verification team confirms the installed physical facilities of the project activity as follows:
<table>
<tr><th>Actual implementation of the project activity</th><th>Consistency with the approved revised PDD</th><th>Assessment by the verification team</th></tr>
<tr><td>Coordinate of the project:
- 0.501322 N
- 33.13895 E</td><td>☒ Yes
☐ No</td><td>The project location has been checked by means of on-site assessment and the coordinates have been verified via Google Earth (version 7.1.1.1580)</td></tr>
<tr><td>Technical specification of generator:
- Model: Alstom SAV 950/98/60
- Unit: 5
- Rated Voltage: 9500 V
- Rated Current: 3768 A
- Rated Power Factor: 0.85
- Phase number: 3</td><td>☒ Yes
☐ No</td><td>Based on technical specifications indicated on the nameplate of turbine-generator set, the verification team is able to cross-check the output capacity of each turbine-generator set to be 52.7 MW (= 9500 V * 3768 A * 0.85 * √3).
In total, 5 units have been installed. Therefore, total installed capacity is calculated as 263.5 MW.
The verification team confirms that installation capacity</td></tr>
</table></td></tr>
</table>

			is in accordance with the approved revised PDD.
	Installation of the main meters (G1-G5 Main) - Location: Switchyard at Bujagali HPP - Accuracy: 0.2s - Calibration frequency: Calibration verification before installation; then every 10 years unless discrepancy of more than 0.5% between main and backup-meter is measured.	☒ Yes ☐ No	The main meters (G1-G5 Main) were inspected by the verification team during the on-site assessment. The main meters within the responsibility of BEL; however, the location in the switchyard is owned and under control of the grid company. The main meters measure the electricity supplied to the grid and drawn from the grid respectively. The verification team confirms that installation of G1-G5 Main is in accordance with the approved revised PDD.
	Installation of the backup meter (G1-G5 Check) - Location: Switchyard at Bujagali HPP - Accuracy: 0.2s - Calibration frequency: Calibration verification before installation; then every 10 years unless discrepancy of more than 0.5% between main and backup-meter is measured.	☒ Yes ☐ No	The backup meters (G1-G5 Check) were inspected by the verification team during the on-site assessment. The back-up meters are the responsibility of the grid company. The back-up meters measure the electricity supplied to the grid and drawn from the grid respectively The verification team confirms that installation of G1-G5 Check is in accordance with the approved revised

			PDD.
Any Project Design Change been sought and approved by EB for the project?	☒ Yes ☐ No	Change in installed capacity from 250 MW to 263.5 MW. In the DOE's opinion, this change does not affect additionality and does not require approval by the EB (section 3.3.1)	
Any Revision in Monitoring plan is sought and approved by EB for the project?	☐ Yes ☒ No	Not applicable	
Does the monitoring report provide line diagram showing all relevant monitoring points?	☐ Yes ☒ No	N/A	

The timeline of the project's implementation is as follow:

Milestone of the project activity	**Timeline**	**Assessment by the verification team**
Commissioning of turbine-generator set 1#	06/02/2012	By means of reviewing </DOC12/>, the verification team confirms that turbine-generator set 1# started generating electricity on 06/02/2012.
Commissioning of turbine-generator set 2#	19/03/2012	By means of reviewing </DOC12/>, the verification team confirms that turbine-generator set 2# started generating electricity on 19/03/2012.
Commissioning of turbine-generator set 3#	18/04/2012	By means of reviewing </DOC12/>, the verification team confirms that turbine-generator set 3# started generating electricity on 18/04/2012.
Commissioning of turbine-generator set 4#	17/05/2012	By means of reviewing </DOC12/>, the verification team confirms that turbine-generator set 4# started generating electricity on 17/05/2012.
Commissioning of turbine-generator set 5#	02/06/2012	By means of reviewing </DOC12/>, the verification team confirms that turbine-generator set 5# started generating electricity on 02/06/2012.
Registration of the project activity	07/10/2011	Verified information as per UNFCCC website: http://cdm.unfccc.int/Projects/DB/ERM-CVS1291830806.57/view
Crediting period	01/12/2011 – 30/11/2018	Verified information as per UNFCCC website: http://cdm.unfccc.int/Projects/DB/ERM-CVS1291830806.57/view
1st monitoring period	01/12/2011 – 31/10/2013	Verified information as per UNFCCC website:

Milestone of the project activity	Timeline	Assessment by the verification team
		http://cdm.unfccc.int/Projects/DB/ERM-CVS1291830806.57/view

In summary, during the current monitoring period, the project is in normal and proper operation. No event or situation occurred during the current monitoring period that impacted the application of the methodology ACM0002 (version 12). The monitoring period is reasonable and the actual implementation of the project activity is appropriate to its CDM development. The verification took cognizance of § 238, 239 & 240 of the CDM Project Standard.

3.2 Compliance of the monitoring plan with the monitoring methodology including applicable tool(s)

The verification team assessed all the information provided in the MR against the applied monitoring methodology.

Determination Requirements	Criteria fulfilled	Determination and reporting by the verification team
Any deviation been sought and approved by EB for the project?	☐ Yes ☒ No	Not applicable
Is complete set of data for the specified monitoring period is available?	☒ Yes ☐ No	As per the monitoring report and spreadsheet of emission reduction calculation
Is the required information provided in the monitoring report has been cross-checked with other sources (ex – plant logbooks, inventories, purchase records, laboratory analysis)?	☒ Yes ☐ No	Please refer to section 3.3.1 and 3.4 of this report for details
Is the calculation of baseline emissions and project activity emissions and leakage been in accordance with the formula and methods described in monitoring plan and the applied methodology?	☒ Yes ☐ No	As per the monitoring report and spreadsheet of emission reduction calculation
Have all assumptions used for emission calculation been justified?	☒ Yes ☐ No	Please refer to section 3.3.1 of this report for details
Have appropriate emission factors, IPCC default values and other reference values been correctly applied?	☒ Yes ☐ No	Please refer to section 3.3.1 of this report for details

The verification team is able to confirm that the monitoring plan contained in the approved revised PDD is in accordance with the approved methodology applied by the project activity, i.e. ACM0002 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (version 12).

3.3 Compliance of the actual monitoring with the monitoring plan in the PDD

The verification team carried out the following activities to confirm that the actual monitoring activity at site is in compliance with the monitoring plan of the approved revised PDD and the reductions in GHG emissions claimed for the monitoring period are conservative.

3.3.1 Monitored parameters

According to the monitoring plan as documented in section B.7.1 of the approved revised PDD and monitoring plan applied, the verification team assessed the parameters as follows:

EX-Post Parameters:
No. 1:

Monitoring Parameter Requirement	Assessment by the verification team
Data / Parameter: (as in monitoring plan of PDD):	$EG_{Facility, y}$
Measuring frequency/Time Interval:	Continuous
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes, verified by means of on-site assessment
Type of monitoring equipment:	Electric meters G1-G5 Main (Main meters) Electric meters G1-G5 Check (Backup meters)
Is accuracy of the monitoring equipment as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practise?	Yes, as per the approved revised PDD
Calibration frequency /interval: Is it Board guidance / local or national standards / manufacturers specification	The meters are factory calibrated. Accuracy verification has been performed prior to installation as required by the manufacturer (/DOC14/ - /DOC26/). The recalibration interval is 10 years unless a discrepancy of 0.5% is measured between main and backup meter. This is in line with the relevant IEC standard.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practise?	The calibration interval is not specifically stated in the approved revised PDD. The frequency of calibration has been chosen appropriately, represents good monitoring practise and is in line with the registered monitoring plan as well as the IEC standard.
Company performing the calibration:	Schneider Electric
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes, as per the calibration certificates, all tests carried out were passed and no error was identified during the calibration. Hence, the verification team confirms that the monitoring devices G1-G5 Main are in proper function.
Is (are) calibration(s) valid for the whole reporting period?	Yes, as per the calibration certificates. Please refer to detailed description in section 3.3.3 of this report.
If applicable, has the reported data been cross-checked with other available data?	Yes, the reported data has been cross-checked with the invoices issued by the PO as well as the backup meter recordings controlled by the grid company (/DOC12/&/DOC13/).
How were the values in the monitoring report verified?	The amount of electricity supplied to the grid during the current monitoring period as reported in the MR has been checked against the invoices /DOC13/ to be consistent.

Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	The measurement records of the main meters G1-G5 Main are used for emission reduction calculation. G1-G5 Main have been installed at switchyard of Bujagali power station and are controlled by plant owner. The measurement records of G1-G5 Main are directly monitored by the central SCADA system of the plant operator. The project owner issues invoices each month to inform the grid company of the measurement record by G1-G5 Main. The backup meter G1-G5 Check which are owned by the grid company and installed at the same location as the main meters in the control room of the switchyard of the project activity serves as cross checking of measurement record of G1-G5 Main. By means of comparison of these data records, the project owner and grid company agree on electricity supply to the grid which is measured by the G1-G5 Main. Moreover, the main meters G1-G5 Main have been calibrated by a qualified entity to ensure accuracy and data quality of measurement.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	Not applicable in the current monitoring period

No. 2: *Cap_{PJ} (Installed capacity of the project activity)*

The registered PDD (/DOC6/) describes the project activity as "…generat[ing] electricity through five vertical Kaplan turbine generator units with an installed capacity of 50 MW each (total capacity of 250 MW)…".

Based on technical specifications indicated on the nameplate of turbine-generator set, the verification team cross-checked the output capacity of each turbine-generator and determined it to be 52.7 MW (= 9500 V * 3768 A * 0.85 * √3).

In total, 5 units have been installed. Therefore, total installed capacity is calculated as 263.5 MW (/DOC31/).

The verification team has identified this as a change to the project design of a registered project activity and followed the verification process outlined in the CDM validation and verification standard (version 07.0).

As the change in installed capacity has not affected the additionality or the implementation of the project activity, the registered PDD (/DOC6/) has been revised (/DOC38/) to reflect the actual situation, following the original version of the methodology. The revised PDD (/DOC38/) has been approved by the CDM EB on 30/07/2014.

No. 3: *A_{PJ} (Area of water reservoir after implementation of the project activity)*

In accordance with the monitoring plan, the water reservoir surface is measured at the maximum water level after implementation of the project activity. As per environmental assessment report /DOC37/, the water reservoir surface reaches its maximum value of 388 ha at the full water level of 1111.5 m.

During the onsite visit review, the verification team checked the automated data records of the water level in the monitoring period. The verification team confirms that the recorded water levels did not exceed the Maximum Flood Level of 1112.0 m and that the average annual water level was below 1111.5 m.

EX-Ante Parameters:

Default values used:	$EF_{grid,CM,y}$ (Combined emission factor of the Uganda Power Grid in year y)
Source and verification of the source	The $EF_{grid,CM,y}$ is fixed ex-ante for the 1st crediting period as per the approved revised PDD. The parameter is fixed ex-ante for the 1st crediting period and does not required to be monitored for the 1st crediting period under monitoring plan. The value of the emission factor considered for the emission reduction calculation (0.658 tCO_2e/MWh) is checked against the approved revised PDD value and found correct.

In summary, verification team confirms that all the ex-ante and ex-post parameters are monitored in accordance to the approved monitoring plan and applied methodology. The verification took cognizance of § 240, 241 & 242 of the CDM Project Standard.

3.3.2 Monitoring responsibility

By means of interview with Mr. Francis Mwangi /I1/, Mr. Edward Oange /I2/, Mr. Valentine Katabira /I6) and Mr. Rions Odock /I3/ who is operation staff of Uganda Electricity Transmission Company Limited (UETCL) at the switchyard of the project activity, the verification team is convinced that the project owner's management and operational procedure as documented in the monitoring and operation manuals (/DOC28/) is in accordance with the registered monitoring plan. Training on operation of the project activity and monitoring arrangement has been given to the responsible personnel regularly (/DOC29/, /DOC30/).

3.3.3 Accuracy of equipment

The monitoring devices have been installed in the project activity according to registered monitoring plan. The table below summarizes relevant specifications of monitoring devices:

	MM1	MM2	MM3	MM4	MM5	BM1	BM2	BM3	BM4	BM5
Function	Main meter for unit #1	Main meter for unit #2	Main meter for unit #3	Main meter for unit #4	Main meter for unit #5	Backup meter for unit #1	Backup meter for unit #2	Backup meter for unit #3	Backup meter for unit #4	Backup meter for unit #5
Abbreviation	G1 Main	G2 Main	G3 Main	G4 Main	G5 Main	G1 Check	G2 Check	G3 Check	G4 Check	G5 Check
Ownership	Project owner	Project owner	Project owner	Project owner	Project owner	Grid company	Grid company	Grid company	Grid company	Grid company
Location	Control room at switchyard	Control room at switchyard	Control room at switchyard	Control room at switchyard	Control room at switchyard	Control room at switchyard	Control room at switchyard	Control room at switchyard	Control room at switchyard	Control room at switchyard
Monitored parameter	$EG_{Facility, y}$	$EG_{Facility, y}$	$EG_{Facility, y}$	$EG_{Facility, y}$	$EG_{Facility, y}$	$EG_{Facility, y}$	$EG_{Facility, y}$	$EG_{Facility, y}$	$EG_{Facility, y}$	$EG_{Facility, y}$
Type	ION 7550	ION 7550	ION 7550	ION 7550	ION 7550	ION 7550	ION 7550	ION 7550	ION 7550	ION 7550
Serial number	PI – 0905A078 -01	PI – 0905A085 -01	PI – 0905A180 -01	PI – 0905A086 -01	PI – 0905A055 -01	PI – 0905A056 -01	PI – 0905A079 -01	PI – 0905A179 -01	PI – 0905A057 -01	PI – 0905A082 -01
Accuracy	0.2s	0.2s	0.2s	0.2s	0.2s	0.2s	0.2s	0.2s	0.2s	0.2s
Calibration date (final verification of calibration before installation)	08/05/ 2009	08/05/ 2009	13/05/ 2009	08/05/ 2009	07/05/ 2009	07/05/ 2009	08/05/ 2009	13/05/ 2009	07/05/ 2009	08/05/ 2009

	MM1	MM2	MM3	MM4	MM5	BM1	BM2	BM3	BM4	BM5
Expiration date of calibration	08/05/ 2019	08/05/ 2019	13/05/ 2019	08/05/ 2019	07/05/ 2019	07/05/ 2019	08/05/ 2019	13/05/ 2019	07/05/ 2019	08/05/ 2019
Frequency of calibration	Every 10 years									
Relevant sectoral standard	ISO/IEC 17025									

All monitoring devices have been physically checked by the verification team during the on-site assessment.

In summary, the verification team is able to verify that the accuracy the monitoring devices were set according to the registered monitoring plan and the relevant standard ISO/IEC 17025. All calibration procedures were carried out according to the monitoring plan and manufacturer specifications.

3.3.4 Deviation from and/or Revision of the registered monitoring plan

Not applicable to the project activity.

3.4 Assessment of data and calculation of greenhouse gas emission reductions

According to the ACM0002 (version 12), emission reductions are calculated as follow:

$ER_y = BE_y – PE_y$

where:

ER_y = Emission reductions in year y (t CO_2e/yr)

BE_y = Baseline emissions in year y (t CO_2e/yr)

PE_y = Project emissions in year y (t CO_2e/yr)

According to formulae in section B.6.1 and B.6.3 of the approved revised PDD,

$ER_y = BE_y = EG_{PJ,y} * EF_{grid, CM,y} = EG_{Facility,y} * EF_{grid,CM,y}$

Assessment of BE_y:

As per ACM0002 (version 12) and approved revised PDD, baseline emissions are calculated to be amount of net electricity supplied to the grid by the proposed project activity multiplying emission factor of the power grid. The verification team confirms that emission factor was ex-ante determined to be 0.658 tCO_2e/MWh at validation stage which is valid for the first crediting period and no monitoring is required. Thus, emission factor of the power grid is justified to be 0.658 tCO_2e/MWh.

The net electricity supplied to the grid was measured by the main meters G1-G5 Main. The main meters measure both electricity supplied to the grid and drawn from the grid and records the result as net electricity supplied to the grid.

According to § 259, 260 & 261 of VVS, the following evidences have been scrutinized by the verification team:

- Amount of net electricity supplied to the grid measured by the project owner (main meters) /DOC12/.
- Amount of net electricity supplied to the grid measured by the grid company (back-up meters) /DOC12/.
- Invoices of electricity sale issued by the project owner /DOC13/.

The verification team cross checked these evidences against each other and took conservative figures for the calculation of emission reductions. Moreover, the “Guidelines on

the application of materiality in verifications" (version 01.0) was taken into consideration during the whole verification process:

- All personnel of project owner and grid company (/I1/, /I2/, /I3/, /I4/, /I6/) who are involved in data management have been interviewed by the verification team during the site visit to ensure the competence level and their authorities of data management;
- The calibration equipment has been factory calibrated by the manufacturer. This calibration has been verified before the final installation. Calibration records of all monitoring devices have been checked by the verification team (/DOC14/ - /DOC26/).
- All monitoring devices included in the project activity were sealed that was confirmed by means of on-site assessment;
- The unique ex-ante parameter for the ER calculation is the emission factor of the power grid which was determined during the validation and approved by the EB;
- No sampling method is included in the registered monitoring plan or applicable to the project activity, as the data (electricity) used for ER calculation was directly and entirely measured. The verification team checked the whole data chain and data management system (i.e. data measurement, data record, data collection, data transfer and data archive) during the on-site assessment and hence confirmed that reported data for ER calculation is correct, free from material errors, omissions or misstatements.

Please refer to details as described in the table below:

Monitoring Period	***Net electricity supplied to the grid measured by main meters (PO's records)***	***Consistency with net electricity supplied to the grid measured by check meters***	***Net electricity supplied to the grid as invoiced by the PO***	***Net electricity generation used for BE calculation***
	/DOC12/	***/DOC12/***	***/DOC13/***	
	G1-G5 Main	***G1-G5 Check***	***ECB invoice***	
	$EG_{Facility, Y}$ (MWh)	***-***	***-***	***MIN ($EG_{Facility,Y}$; ECB invoice)***
01/12/2011 – 31/12/2011	0.00	YES	0.00	0.00
01/01/2012 - 31/01/2012	0.00	YES	0.00	0.00
01/02/2012 - 29/02/2012	21,966.70	YES	17,860.00	17,860.00
01/03/2012 - 31/03/2012	45,540.90	YES	43,638.00	43,638.00
01/04/2012 - 30/04/2012	72,739.39	YES	72,736.69	72,736.69
01/05/2012 - 31/05/2012	82,009.64	YES	82,009.08	82,009.08

01/06/2012 - 30/06/2012	107,060.61	YES	107,045.80	107,045.80
01/07/2012 - 31/07/2012	114,573.23	YES	114,557.29	114,557.29
01/08/2012 - 31/08/2012	111,341.51	YES	111,325.75	111,325.75
01/09/2012 - 30/09/2012	102,625.85	YES	102,616.71	102,616.71
01/10/2012 - 31/10/2012	104,561.78	YES	104,547.63	104,547.63
01/11/2012 - 30/11/2012	106,422.61	YES	106,406.99	106,406.99
01/12/2012 - 31/12/2012	104,324.87	YES	104,311.34	104,311.34
01/01/2013 - 31/01/2013	116,338.03	YES	116,322.64	116,322.64
01/02/2013 - 23/02/2013	108,652.03	YES	108,637.80	108,637.80
01/03/2013 - 31/03/2013	119,956.87	YES	119,939.98	119,939.98
01/04/2013 - 30/04/2013	110,468.22	YES	110,452.24	110,452.24
01/05/2013 - 31/05/2013	120,437.58	YES	120,420.23	120,420.23
01/06/2013 - 30/06/2013	120,057.67	YES	120,039.45	120,039.45
01/07/2013 - 31/07/2013	127,523.56	YES	127,508.39	127,508.39
01/08/2013 - 31/08/2013	119,840.92	YES	119,821.30	119,821.30
01/09/2013 - 30/09/2013	106,848.23	YES	106,837.35	106,837.35
01/10/2013 - 31/10/2013	111,016.96	YES	110,998.91	110,998.91
Total	**2,134,307.16**	**-**	**2,128,034**	**2,128,034**

The main meter records controlled by the PO are considered to be most reliable evidences for baseline emission calculation, as they directly reflect the measured amount of net electricity supplied to the grid. The figures in from G1-G5 Main have also been cross-checked by the verification team against other verifiable sources, namely against the measurement records of the backup meters (G1-G5 Check) as well as the invoices of electricity sale. The most conservative data measured was applied for baseline emission calculation as elaborated in the table above.

It is confirmed that the amount of net electricity supplied to the grid as reported in the MR is correct and accurate.

The spreadsheet of ER calculation attached to the monitoring report (/DOC36/) transparently elaborated each reported figure for ER calculation and has been checked by the verification team to be correct.

The table below summarizes baseline emission verified:

Monitoring period	**$EG_{Facility,y}$ *(MWh)***	**$EF_{grid, CM,y}$ *(tCO_2e/MWh)***	***BE_y (tCO_2e)***
01/12/2011 – 31/12/2011	0.00	0.658	0.00
01/01/2012 - 31/01/2012	0.00	0.658	0.00
01/02/2012 - 29/02/2012	17,860.00	0.658	11,745
01/03/2012 - 31/03/2012	43,638.00	0.658	28,697
01/04/2012 - 30/04/2012	72,736.69	0.658	47,832
01/05/2012 - 31/05/2012	82,009.08	0.658	53,929
01/06/2012 - 30/06/2012	107,045.80	0.658	70,394
01/07/2012 - 31/07/2012	114,557.29	0.658	75,333
01/08/2012 - 31/08/2012	111,325.75	0.658	73,208
01/09/2012 - 30/09/2012	102,616.71	0.658	67,481
01/10/2012 - 31/10/2012	104,547.63	0.658	68,751
01/11/2012 - 30/11/2012	106,406.99	0.658	69,974
01/12/2012 - 31/12/2012	104,311.34	0.658	68,596
01/01/2013 - 31/01/2013	116,322.64	0.658	76,494
01/02/2013 - 23/02/2013	108,637.80	0.658	71,441
01/03/2013 - 31/03/2013	119,939.98	0.658	78,873
01/04/2013 - 30/04/2013	110,452.24	0.658	72,634

01/05/2013 - 31/05/2013	120,420.23	0.658	79,189
01/06/2013 - 30/06/2013	120,039.45	0.658	78,938
01/07/2013 - 31/07/2013	127,508.39	0.658	83,850
01/08/2013 - 31/08/2013	119,821.30	0.658	78,795
01/09/2013 - 30/09/2013	106,837.35	0.658	70,257
01/10/2013 - 31/10/2013	110,998.91	0.658	72,993
Total	**2,128,034**	0.658	**1,399,403**

Assessment of PE_y:

According to ACM0002 (version 12) and approved revised PDD, the project emission of the project activity occurs when the power density is greater than 4 W/m^2 and less than or equal to 10 W/m^2.

By means of observation of the nameplates of the turbine-generator sets during the on-site assessment, the total installed capacity of the project activity is verified to be 263.5 MW. The water reservoir surface at its maximum level was measured automatically by the plant's SCADA system operated by BEL. As per environmental assessment report (/DOC37/), the water reservoir surface reaches its maximum value of 388 ha at the water level of 1111.5 m during the current monitoring period. Hence, the power density works out to be 67.9 W/m^2 at the full level of water reservoir. The value is greater than 10 W/m^2 and project emission is zero according to the methodology ACM0002 (version 12). During the on-site assessment, the verification team checked the data records during the monitoring period. The average water level did not exceed 1111.5 m. Furthermore, no activity that would result in the expansion of reservoir size was observed by the verification team during the on-site assessment. The verification team is hence confirmed that maximum value of water reservoir doesn't exceed 388 ha and power density at maximum water reservoir level in the current monitoring period is assured.

Two emergency backup diesel generators are installed onsite.

(1) Diesel fuelled generator, load capacity 300 kW, located at the switchyard.

(2) Diesel fuelled generator, load capacity 1,165 kW, located at the power house.

In accordance with the methodology (ACM0002 version 12) fossil fuel for electricity generation does not have to be accounted for in hydropower projects.

In summary, project emission is zero in the current monitoring period. $PE_y = 0$.

Assessment of L_y:

According to ACM0002 (version 12) and approved revised PDD, leakage emission is neglected and thus $L_y = 0$.

Emission Reductions (ER_y):

$ER_y = BE_y - PE_y = 1,399,403 - 0 = 1,399,403$ tCO_2e over the monitoring period from 01/12/2011 to 31/10/2013 including both days.

In conclusion, all parameters are used correctly in the calculations; all results are verifiable and transparent; all assumptions are described and based on verifiable evidence and calculations are done in accordance with the pre-defined formulae from approved revised PDD. The emission reductions are verified to be 1,399,403 tCO_2e during the current monitoring period based on verifiable evidences.

3.4.1 Assessment of actual emission reductions with the estimate emission reductions in PDD

Estimated Emission Reduction as per Registered/Approved PDD:	1,648,162 tCO_2e
Actual Emission Reduction for the Monitoring Period	1,399,403 tCO_2e
Has any increase of CER's occurred?	No
Reason for difference of CER's	Refer to assessment below

Against the Guidelines on the application of materiality in verifications (version 01.0), the verification team further assessed the materiality in verification on the project activity and interpreted as follows:

Reference	Requirement	Verification team assessment
Section 10	The CMP materiality decision prescribes the thresholds for the application of materiality in verifications, by defining that information is material if it might lead, at an aggregated level, to an overestimation of the total emission reductions or removals achieved by a CDM project activity equal to or higher than: (a) 0.5 per cent of the emission reductions or removals for project activities achieving a total emission reduction or removal of equal to or more than 500,000 tons of carbon dioxide equivalent per year; (b) 1 per cent of the emission reductions or removals for project	According to the approved revised PDD, the project is a large-scale CDM project activity achieving total emission reductions is 858,173 tons of CO_2e per year, which is more than 500,000 tons of CO2e per year. As per the § (c) of Guidelines on the application of materiality in verifications (version 01.0), a 0.5% materiality threshold shall be applied. As stipulated in the § 17 of Guidelines on the application of materiality in verifications (version 01.0), the materiality threshold shall apply to the total emission reductions or removals actually achieved. As verified in the section 3.4 of this report, the total emission reductions actually achieved

	activities achieving a total emission reduction or removal between 300,000 and 500,000 tons of carbon dioxide equivalent per year; (c) 2 per cent of the emission reductions or removals for large-scale project activities achieving a total emission reduction or removal of 300,000 tons of carbon dioxide equivalent per year or less; (d) 5 per cent of the emission reductions or removals for small-scale project activities other than project activities covered under subparagraph (e) below; (e) 10 per cent of the emission reductions or removals for the type of project activities referred to in decision 3/CMP.6, paragraph 38 (referred to as microscale project activities).	during the monitoring period is 1,399,403 tCO_2e, thus the materiality threshold of the project activity is identified to be 6,997.015 tCO_2e = 1,399,403 tCO_2e * 0.5%
Section 24	The DOE should describe in its certification/certification report the risks, the risk assessment undertaken and how the verification and sampling plans were designed to respond to these risks and ensure that all material errors, omissions or misstatements were detected.	The risk assessment was conducted by the verification team as follows: a) The meter records and invoices were checked to be complete data set to reasonably calculate the total emission reductions achieved during the monitoring period. During the start-up phase (Feb & Mar 2012) of the project unit 1 and unit 2 were sent to the grid for several days during commissioning tests before the start of reliability run, as shown by the meter records. However, the invoices only show electricity generation claimed after the beginning of reliability run. For reasons of conservativeness and verification the lower values show in the invoices (Feb & Mar 2012) have been utilized for the emission reduction calculations. b) All monitoring devices have been calibrated by the manufacturer and verified by a third qualified party that ensure the accuracy of all monitoring devices during the monitoring period; c) All monitoring devices included in the project activity were

		sealed that was confirmed by means of on-site assessment; d) All personnel of project owner and grid company who are involved in data management have been interviewed by the verification team to ensure the competence level and their authorities of data management; e) By means of cross checking the spreadsheet of emission reduction calculation, the meter records and the invoices, the verification team confirms that the emission reduction has been accurately calculated. f) Unique ex-ante parameter for ER calculation is emission factor of the power grid which was determined during the validation and approved by the EB A difference of 1,120 tCO_2e (=0.08%) in the overall emission reduction between the public MR and the final MR has been detected by the verification team. Therefore, error = 0.08%.
Section 25	The DOE should also describe whether and how the verification and sampling plans were revised to take into account the need for further audit procedures due to the nature/type of errors, omissions or misstatements detected.	No sampling method is included in the registered monitoring plan or applicable to the project activity, as the data (electricity) used for ER calculation was directly and entirely measured.
Section 26	The DOE should also document how materiality was applied in determining whether a detected error, omission or misstatement was material or immaterial either individually or in aggregate.	Considering that the error of 0.08% = 1,120 tCO_2e is less than the materiality threshold of 7,002.615 tCO_2e identified, the verification team determines that the detected error is immaterial.
Section 27	The DOE should state in its certification/certification opinion that the claimed emission reductions or removals are free from material errors, omissions or misstatements, with a reasonable level of assurance.	Refer to Certification statement of this report.

3.5 Issues remaining from the previous verification period

The project is under 1st verification. Therefore, no open issues remain from the previous verification period. Furthermore, no FARs remain from the validation report.

Appendix A

CDM Verification protocol

Bujagali Hydropower Project
in
Uganda

to Report No. 01 997 9105077275

Checklist question	Ref.	MoV[5]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
1. Implementation					
1.1 Have all physical features proposed in the approved revised PDD been implemented at the project site? § 239 of CDM Project Standard	MR	DR I	By means of document review and on-site observation, the verification team confirms that the physical facilities (i.e. turbines, monitoring system) as described in the approved revised PDD have been implemented at the project site. The only exception to this is the installed capacity (see 1.2).	~~CAR 3~~	
1.2 Has the project activity been operated in accordance with the project scenario described in the approved revised PDD and relevant guidance? Reference: <http://cdm.unfccc.int/EB/033/eb33rep.pdf > § 237 of CDM Project Standard	MR	DR I	The project has been put into operation. By means of observation of nameplate of turbine and generator during the on-site assessment, the verification team confirms consistency of technical specification with approved revised PDD. As the MR version 0.1 was still based on the registered PDD rather than the approved revised PDD, it states a capacity of 250 MW. The name plates of the generators demonstrate a capacity of 52.7 MW, resulting in an overall installed capacity of 263.5 MW. This has been updated in the approved revised PDD as well as MR 1.1.	~~CAR 3~~	OK

[5] MoV = Means of Verification, DR = Document Review, I = Interview, www = internet search.

Checklist question	Ref.	MoV[5]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
1.3 If the project activity is implemented on a number of different locations, has the Monitoring report provided the verifiable starting dates for each site? § 240 of CDM Project Standard	MR	DR I	Not applicable	OK	OK
1.4 Is the start date of monitoring period consistent?	MR	DR	Yes, the start date within the monitoring period is consistent.	OK	OK
1.5 Is the monitoring report consistently filled with respect to all sections as required by its guideline of filling the monitoring report?	MR	DR	The MR does not contain information on the existence of emergency diesel generators on site or the change in installed capacity. The MR does not specifically outline the accurate starting dare of electricity generation by each unit. The MR does not display the executed inspection days of the units until the end of the monitoring period.	~~CAR 1~~ ~~CAR 2~~ ~~CAR 3~~ ~~CAR 4~~	OK
1.6 Are the CERs obtained for the monitoring period within the limit of estimate in the approved revised PDD? Request for justification for higher estimated CER if not clarified.	MR	DR	The actual CERs are lower than the anticipated amount in the approved revised PDD.	OK	OK
1.7 Is the monitoring system provided in line diagrams showing all relevant monitoring points?	MR	DR	Not applicable	OK	OK
2. Monitoring plan and methodology					

Checklist question	Ref.	MoV[5]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
2.1 Is the monitoring plan established in accordance with the monitoring methodology? § 238 of CDM Project Standard	MR	DR	The monitoring plan in particular of data monitoring, data record, data collection, data archive, data review, data transfer and QA/QC procedure are in accordance with ACM0002 (version 12).	OK	OK
2.2 In case the implemented monitoring plan defers from the monitoring methodology, has any requests for revision to or deviation from the monitoring methodology been officially communicated to the CDM EB? Reference: § 258, 259 & 260 of CDM Project Standard (for temporary deviation) § 261 & 262 of CDM Project Standard (for permanent change)	MR	DR	Not applicable	OK	OK
2.2.1 Have the above changes to the monitoring plan been approved by the CDM EB?	MR	DR	Not applicable	OK	OK
3. Monitoring and the monitoring plan					

Checklist question	Ref.	MoV[5]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
3.1 Is monitoring established in full compliance with the monitoring plan, contained in the approved revised PDD (or new monitoring plan approved by the CDM EB)? § 264 of CDM Project Standard	MR	DR	Yes, the monitoring of - net electricity supplied to the grid - total installed capacity - water reservoir area is in full compliance with the monitoring plan as documented in the approved revised PDD.	OK	OK
3.2 Are all baseline emission parameters monitored and updated in accordance with monitoring plan, monitoring methodology and relevant CDM EB decisions?	MR	DR	Yes, all baseline emission parameters monitored is in accordance with registered monitoring plan and monitoring methodology – ACM0002, version 12.	OK	OK
3.2.1 Was the monitoring equipment for baseline emission parameters controlled and monitoring results recorded as per approved frequency?	MR	DR I	The monitoring equipment for baseline emission has been controlled by the grid company. The monitoring parameters are recorded monthly as per registered monitoring plan.	OK	OK
3.2.2 Was the monitoring equipment for baseline emission parameters calibrated in accordance with QA&QC procedures described in the registered monitoring plan?	MR	DR I	The meters are factory calibrated. Accuracy verification has been performed prior to installation as required by the manufacturer. The calibration frequency is in line with the applicable IEC standard.	OK	OK

Checklist question	Ref.	MoV[5]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
3.3 Are all project emission parameters monitored and updated in accordance with monitoring plan, monitoring methodology and relevant CDM EB decisions?	MR	DR	Not applicable	OK	OK
3.3.1 Was the monitoring equipment for project emission parameters controlled and monitoring results recorded as per approved frequency?	MR	DR	Not applicable	OK	OK
3.3.2 Was the monitoring equipment for project emission parameters calibrated in accordance with QA&QC procedures described in the registered monitoring plan?	MR	DR	Not applicable	OK	OK
3.4 Are all leakage emission parameters monitored and updated in accordance with monitoring plan, monitoring methodology and relevant CDM EB decisions?	MR	DR	Not applicable	OK	OK
3.4.1 Was the monitoring equipment for leakage emission parameters controlled and monitoring results recorded as per approved frequency?	MR	DR	Not applicable	OK	OK
3.4.2 Was the monitoring equipment for leakage emission parameters calibrated in accordance with QA&QC procedures described in the registered monitoring plan?	MR	DR	Not applicable	OK	OK

Checklist question	Ref.	MoV[5]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
3.5 Were all monitoring parameters available and verifiable through the whole monitoring period?	MR	DR	All monitoring parameters are available and verifiable through the whole monitoring period.	OK	OK
3.5.1 In case, only partial monitoring data is available and PP(s) provide estimations or assumptions for the rest of data, was it possible to verify those estimations and assumptions? Reference: <http://cdm.unfccc.int/EB/026/eb26rep.pdf	MR	DR	Not applicable	OK	OK
3.6 Was management and operation system established and operated in accordance with the monitoring plan?	MR	DR I	By means of reviewing the monitoring and operation manual, the verification team confirms that the management and operation system is operated in accordance with the monitoring plan.	OK	OK
3.7 Was is it possible to verify that involved management and operation personal is fully aware of the responsibilities and perform all operations according to the registered monitoring plan and internally developed manuals?	MR	DR I	The qualification certificates of operation staff has been reviewed by the verification team to be effective. Furthermore, training on operation of the project and monitoring arrangement has been given to the operation staff.	OK	OK

Checklist question	Ref.	MoV[5]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
4. Parameters					
4.1 **Monitored parameter** Title: Quantity of net electricity generation supplied by the project plant/unit to the grid in year y Indication: $EG_{Facility,y}$ Units: MWh Estimated value (*ex-ante*): 1,305,000 annually Measured value (*ex-post*): 2,128,034 in the current monitoring period	MR	DR	Please refer to table 2 for more details	~~CAR 5~~ ~~CAR 6~~	OK
4.2 **Monitored parameter** Title: Installed capacity of the hydro power plant after the implementation of the project activity Indication: Cap_{PJ} Units: MW Estimated value (*ex-ante*): 250 Measured value (*ex-post*): 263.5	MR	DR	The project has been put into operation. By means of observation of nameplate of turbine and generator during the on-site assessment, the verification team confirms consistency of technical specification with registered PDD, apart from the installed capacity. The name plates of the generators demonstrate a capacity of 52.7 MW, resulting in an overall installed capacity of 263.5 MW, whereas the registered PDD and MR v0.1 state a capacity of 250 MW. This has been updated in the approved revised PDD as well as MR 1.1.	~~CAR 3~~	OK

Checklist question	Ref.	MoV[5]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
4.3 **Monitored parameter** Title: Area of the reservoir measured in the surface of the water, after the implementation of the Project activity, when the reservoir is full. Indication: A_{PJ} Units: m^2 Estimated value (*ex-ante*): 3,880,000 Measured value (*ex-post*): 3,880,000	MR	DR	As per environmental assessment report (/DOC38/), the water reservoir surface reaches its maximum value of 388 ha at the water level of 1111.5 m during the current monitoring period. During the on-site assessment, the verification team checked the data records during the monitoring period. The average water level did not exceed 1111.5 m.	OK	OK
4.4 **Default parameter** Title: Combined margin CO2 emission factor Indication: $EF_{grid,CM,y}$ Units: t CO_2e/MWh Default/Used value: 0.658	MR	DR	As per approved revised PDD, the emission factor has been calculated by ex-ante method and thus the emission factor doesn't need to be monitored or recalculated for the current crediting period.	OK	OK
5. Calculations					
5.1 Have all the calculations related to the baseline emissions been carried according to the formulae and methods described in the approved revised PDD and applied methodology? § 246 of CDM Project Standard	MR	DR	The verification team confirms that appropriate formulae and methods have been used as per the approved revised PDD and monitoring methodology. The values for emission reduction calculation have been cross checked to be correct.	OK	OK
5.2 Have all the calculations related to the project emissions been carried according	MR	DR	Not applicable	OK	OK

Checklist question	Ref.	MoV[5]	Findings, comments, references, data sources	Draft conclusion	Final conclusion
to the formulae and methods described in the approved revised PDD and applied methodology?					
5.3 Have all the calculations related to the leakage emissions been carried according to the formulae and methods described in the approved revised PDD and applied methodology?	MR	DR	Not applicable	OK	OK

Table 2: List of Requests for Corrective Action (CAR) and Clarification (CL)				
No.	**CAR**	**Reference**	**Summary of project owner response**	**Verification team conclusion**
1	Accurate starting date of electricity generation by each unit is not reflected in the MR. The corrective action is requested.	Table 1 1.5 [MR v0.1, section A.1]	Accurate starting date per unit is now included in the MR with supporting documents provided under folders "Check meters net export per unit per month" and "Main meters net export per unit per month " in the shared link with the DOE on dropbox that contains additional documents, data and information of the project.	OK The accurate information has been included in the MR and supportive evidence has been provided. The CAR is closed.
2	During the on-site assessment, two diesel generators were observed by the verification team. Corresponding information of diesel generators is not described in the MR. The corrective action is requested.	Table 1 1.5 [MR v0.1, section E.2]	Information on the emergency diesel generators are now included in the MR. However, please note that the methodology (ACM0002 version 12, page 6, applied in the PDD) asks for project emission calculation due to fossil fuel combustion from solar and geothermal projects only.	OK Information on the two diesel generators has been included The CAR is closed.
3	Actual installed capacity of project activity deviates from information in the registered PDD and the MR. The corrective action is requested.	Table 1 1.1 1.2 1.5 4.3 [MR and PDD]	The PDD has been updated using the latest PDD template format version 4.1 to include the actual generator's power capacity of 52.7 MW instead of 50 MW. However, please note that although the project is registered as a 250MW power plant, the additional capacity of 2.7 MW per unit (each of 50	OK Both the PDD and MR v1.1 has been updated and checked by the verification team. The CAR is closed.

Table 2: List of Requests for Corrective Action (CAR) and Clarification (CL)				
No.	**CAR**	**Reference**	**Summary of project owner response**	**Verification team conclusion**
			MW) is very common in large scale hydro plants to give the plant more flexible control over its operational load settings influenced by water head and discharge fluctuations from upstream. Furthermore the load demands from the UETCL dispatch centre has to be coordinated with other power plants upstream Bujagali (e.g. Nalubaale) which explains the needs for this ~5% additional capacity per unit. Noteworthy to mention that this extra load has no major impact on plant's annual power generation neither on the PDD's additionality argument that is based on barrier analysis. The PDD has been updated to include the actual generator's power capacity of 52.7 MW instead of 50 MW, thus a total capacity of 263.5 MW instead of 250 MW.	
4	The Bujagali HPP Outage Chart August 2013 - July 2014 (Fig. 5) displays the executed inspection days only until September 2013 rather than until the end of the monitoring period (31 Oct 2013). The corrective action is requested.	Table 1 1.5 [MR v0.1, page 6, Fig. 5]	The MR now includes the correct figure.	OK The outage charts covering the entire monitoring period have been included. The CAR is closed.

Table 2: List of Requests for Corrective Action (CAR) and Clarification (CL)				
No.	**CAR**	**Reference**	**Summary of project owner response**	**Verification team conclusion**
5	The net electricity generation for November 2012 of Unit 5 in the ER is not consistent with the submitted evidence (SCADA records). The corrective action is requested.	Table 1 4.1 [ER, version from 5 March 2014, "BEL's net generation overview"]	The figure has been corrected in the ER sheet and consequently the total ER of the project is updated in the MR.	OK The CAR is closed.
6	The net electricity generation for February 2012 and March 2012 is not consistent with the submitted evidence (ECB invoices). The corrective action in the ER and MR is requested.	Table 1 4.1 [ER, version submitted on 04/ April 2014, "BEL's net generation overview" MR v1.0]	The net electricity generation for February and March 2012 from ECB reports has been compared with SCADA and the most conservative figure has been used for ER calculations.	OK The ECB invoices only claim for electricity generated after the reliability run. These more conservative figures have been used for the ER calculations. The CAR is closed.

Appendix B

Certification statement
to the Verification Report 01 99791050 77275

Certification statement

TÜV Rheinland (China) Ltd., the DOE, has performed a verification of the registered CDM project activity No. 4217, "Bujagali Hydropower Project" in Republic of Uganda. The project activity is designed to generate emission reductions by generation of electricity from renewable hydro energy resource.

The project participants are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project. It is DOE's responsibility to express an independent verification statement on the reported GHG emission reductions from the project. The DOE does not express any opinion on the selected baseline scenario or on the validated and approved revised PDD.

The verification was performed to identify the compliance of the project activity with implementation and monitoring requirements, and to verify the actual amount of achieved emission reductions, through obtaining evidence and information on-site that included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied, ii) the collection of evidence supporting the reported data and iii) emission reductions that are claimed is free from material errors, omissions or misstatements.

The verification is based on:

- Registered PDD (version 2.0, dated 06/10/2011);
- Approved revised PDD (version 2.1, dated 05/03/2014);
- Approved monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 12;
- Monitoring report of current monitoring period (version 0.1, dated 13/11/2013);
- Monitoring report of current monitoring period (version 1.1, dated 26/08/2014).

This statement covers verification period from 01/12/2011 to 31/10/2013 including both days.

The DOE has raised 6 corrective action requests, all of which have been successfully resolved by PPs.

The DOE considers necessary to give reasonable assurance that reported GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology and the monitoring plan contained in the approved revised PDD are fairly stated.

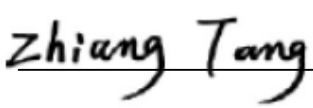
The breakdown of the emission reductions for the monitoring period has also been clearly demonstrated, with emission reduction for second commitment period calculated using the latest GWPs and the following is verified to be correct:

Actual emission reduction for the monitoring period up to and including) 31 December 2012	635,939 tCO_2e

Actual emission reduction for the monitoring period from (and including) 1 January 2013	763,464 tCO_2e

The DOE, hereby certifies that the project activity, achieved emission reductions by sources of GHG equal to **1,399,403** tCO_2 equivalent and all monitoring requirements have been fulfilled.

The DOE states that the claimed emission reductions are free from material errors, omissions and misstatements with a reasonable level of assurance.

2014-09-15 Date	2014-09-15 Date	2014-09-01 Date
		
Mr. Henri Phan DOE Manager TÜV Rheinland (China) Ltd.	Mr. Walter Tang Technical Reviewer TÜV Rheinland (China) Ltd.	Mr. Norbert Heidelmann Team Leader TÜV Rheinland Energie und Umwelt GmbH

Appendix C

CERTIFICATES OF COMPETENCE

Qualification

Heidelmann, Norbert /

Emission Trading
United Nations Framework Convention on Climate Change

Auditor No.: (AuditorenRegNr)			
Appointed: (Zugelassen)	☒ ja	Qualification Level: (Qualifikationsstufe)	Lead Auditor
External: (Externer)	☐ ja	Add. reviewer: (Zusätzlicher Prüfer)	☐ yes
EAC Scopes: (EAC Branchen)	CDM 01 - Energy industries (renewable - / non-renewable sources) CDM 13 - Waste handling and disposal CDM 15 - Agriculture		
Add. qualification: (zus. Qualifikation)			
First Appointment: (Erstberufung)	03.05.2010	Valid to: (Gültig bis)	01.05.2016

Remarks:	Appointment valid for TA 1.2, 13.1, 13.2, 15.2
Languages:	German English

Qualification

Nuesse, Andrea /

Emission Trading
United Nations Framework Convention on Climate Change

Auditor No.: (AuditorenRegNr)			
Appointed: (Zugelassen)	☒ ja	Qualification Level: (Qualifikationsstufe)	Trainee
External: (Externer)	☐ ja	Add. reviewer: (Zusätzlicher Prüfer)	☐ yes
EAC Scopes: (EAC Branchen)			
Add. qualification: (zus. Qualifikation)			
First Appointment: (Erstberufung)	29/01/2014	Valid to: (Gültig bis)	28/01/2017

Remarks:

Languages: English
German

Qualification

Tang, Walter /

Emission Trading
United Nations Framework Convention on Climate Change

Auditor No.:
(AuditorenRegNr)

Appointed: (Zugelassen)	☒ ja	Qualification Level: (Qualifikationsstufe)	Lead Auditor
External: (Externer)	☐ ja	Add. reviewer: (Zusätzlicher Prüfer)	☐ yes
EAC Scopes: (EAC Branchen)	CDM 01 - Energy industries (renewable - / non-renewable sources) CDM 02 - Energy distribution CDM 03 - Energy demand CDM 13 - Waste handling and disposal CDM 04 - Manufacturing industries		
Add. qualification: (zus. Qualifikation)			
First Appointment: (Erstberufung)	10/11/2011	Valid to: (Gültig bis)	09/11/2015

Remarks:	Appointed as Technical Reviewer for TA 1.1, 1.2, 2.1, 2.2, 3.1 Direct work experience. TA 4.3, 4.5, 13.1 based on Annex D para 9 of the Accrediation Standard
Languages:	Chinese simplified English

Qualification

Cui, You /

Emission Trading
United Nations Framework Convention on Climate Change

Auditor No.: (AuditorenRegNr)			
Appointed: (Zugelassen)	☒ ja	Qualification Level: (Qualifikationsstufe)	Lead Auditor
External: (Externer)	☐ ja	Add. reviewer: (Zusätzlicher Prüfer)	☒ yes
EAC Scopes: (EAC Branchen)	CDM 01 - Energy industries (renewable - / non-renewable sources) CDM 13 - Waste handling and disposal		
Add. qualification: (zus. Qualifikation)			
First Appointment: (Erstberufung)	04.09.2009	Valid to: (Gültig bis)	02.08.2015

Remarks:	Valid for TA 1.2, 13.1 + Part Time TR
Languages:	Chinese English German

Qualification

Lozynskyy, Yuriy /

Emission Trading
United Nations Framework Convention on Climate Change

Auditor No.:
(AuditorenRegNr)

Appointed: (Zugelassen)	☒ ja	Qualification Level: (Qualifikationsstufe)	Lead Auditor
External: (Externer)	☐ ja	Add. reviewer: (Zusätzlicher Prüfer)	☐ yes
EAC Scopes: (EAC Branchen)	CDM 13 - Waste handling and disposal CDM 01 - Energy industries (renewable - / non-renewable sources) CDM 07 - Transport		
Add. qualification: (zus. Qualifikation)	JI		
First Appointment: (Erstberufung)	08.11.2010	Valid to: (Gültig bis)	07.11.2013

Remarks:	Valid for TA 1.2, 13.1, 7.1
Languages:	German Russian Ukrainian English Polish

Experience Exchange

Date	Location	Remarks	Accreditation(s)
2011-03-22	Cologne	Experience Exchange Cologne 2011	United Nations Framework Convention c Change

Monitoring

Latest Monitoring:
(letzte Beurteilung)

Next Monitoring:
(nächste Beurteilung)

Remarks:

View / Edit Monitoring

History of scope allocation

Date:	2012-06-25
Change:	EAC CDM added
By:	Praveen Urs
Reason:	
Date:	2011-11-07
Change:	Non-EAC JI added
By:	Manfred Brinkmann
Reason:	
Date:	2011-04-08
Change:	EAC CDM added
By:	Manfred Brinkmann
Reason:	Valid for TA 1.2, 13.1
Date:	2010-11-11
Change:	EAC CDM added
By:	Manfred Brinkmann
Reason:	

History

Created:	15.06.2010 12:22:48	Yuriy Lozynskyy/TEU/DE/TUEV
Modified:	25.06.2012 14:45:19 ZE8	Praveen Urs/Chn/TUV
	25.06.2012 14:44:32 ZE8	Praveen Urs/Chn/TUV
	07.11.2011 22:06:18 ZE9	Manfred Brinkmann/Jpn/TUV
	07.11.2011 22:05:19 ZE9	Manfred Brinkmann/Jpn/TUV
	08.04.2011 13:24:15 ZE9	Manfred Brinkmann/Jpn/TUV
	08.04.2011 13:23:16 ZE9	Manfred Brinkmann/Jpn/TUV
	08.04.2011 13:21:34 ZE9	Manfred Brinkmann/Jpn/TUV
	08.04.2011 13:21:23 ZE9	Manfred Brinkmann/Jpn/TUV
	08.04.2011 13:21:08 ZE9	Manfred Brinkmann/Jpn/TUV
	04.02.2011 14:23:43 ZE9	Manfred Brinkmann/Jpn/TUV
	04.02.2011 14:22:31 ZE9	Manfred Brinkmann/Jpn/TUV
	04.02.2011 14:22:19 ZE9	Manfred Brinkmann/Jpn/TUV
	11.11.2010 05:22:13 ZE9	Manfred Brinkmann/Jpn/TUV
	15.06.2010 12:23:50	Yuriy Lozynskyy/TEU/DE/TUEV

Qualification

Gaydarova-Itrib, Denitsa /

Emission Trading
United Nations Framework Convention on Climate Change

Auditor No.:
(AuditorenRegNr)

Appointed: (Zugelassen)	☒ ja	Qualification Level: (Qualifikationsstufe)	Trainee
External: (Externer)	☐ ja	Add. reviewer: (Zusätzlicher Prüfer)	☐ yes
EAC Scopes: (EAC Branchen)	00 - no scope needed		
Add. qualification: (zus. Qualifikation)			
First Appointment: (Erstberufung)	01/02/2012	Valid to: (Gültig bis)	01/31/2015

Remarks:

Languages:
Bulgarian
English
German
Arabic
Russian

Experience Exchange

Date	Location	Remarks	Accreditation(s)

Monitoring

Latest Monitoring:
(letzte Beurteilung)

Next Monitoring:
(nächste Beurteilung)

Remarks:

View / Edit Monitoring