




**Verification and certification report form for
CDM project activities
(Version 02.1)**

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION

Title and UNFCCC reference number of the project activity	Kainji Hydropower Rehabilitation Project, Nigeria. UNFCCC Ref. No. 7726
Version number of the verification and certification report	1.1Aa
Completion date of the verification and certification report	08/04/2019
Monitoring period number and duration of this monitoring period	First monitoring period. 01/01/2013 – 31/12/2017
Version number of the monitoring report to which this report applies	02
Crediting period of the project activity corresponding to this monitoring period	01/01/2013 – 31/12/2022
Project participants	<p>Nigeria: Power Holding Company of Nigeria (PHCN) (withdrawn as of 17/07/2017); Mainstream Energy Solutions.</p> <p>Sweden: International Bank for Reconstruction and Development as Trustee of the Umbrella Carbon Facility Tranche 2 (UCFT2); Government of Sweden - Swedish Energy Agency.</p> <p>Belgium: Electrabel SA</p> <p>Italy: Enel Global Trading S.p.A</p> <p>Germany: Statkraft Markets GmbH</p>
Host Party	Nigeria
Applied methodologies and standardized baselines	ACM0002 version 12 – Consolidated baseline methodology for grid-connected electricity generation from renewable sources.
Mandatory sectoral scopes linked to the applied methodologies	1: Energy industries (renewable/non-renewable sources)
Conditional sectoral scope(s) linked to the applied methodologies	NA
Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD	4,336,017 tCO ₂ e
Certified amount of GHG emission reductions or GHG removals for this monitoring period	2,651,087 tCO ₂ e
Name and UNFCCC reference number of the DOE	RINA SERVICES S.p.A. E-0037
Name, position and signature of the approver of the verification and certification report	<p>Laura SEVERINO (Authorized officer signing for the DOE) Head of Sustainability & Food Certification Compliance Unit</p> 

SECTION A. Executive summary

Purpose and general description of the project activity

The project activity covers the rehabilitation of existing unit 5, 6 and 12 at the Kainji Hydropower powerhouse. Rehabilitation includes: installation of new turbines, new generators, new governors, and rehabilitation of auxiliary services (control system, new diesel generator, and new water supply, upgrading ventilation system) and upgrading of monitoring equipment. The facility, when it was fully commissioned, was equipped with 8 turbines (numbered 5 to 12) with a total installed capacity of 760 MW. The Kainji hydropower station is located on the Niger River, in Niger State, in Kainji city.

Scope of verification

This report summarizes the findings of the verification of the project, performed based on UNFCCC criteria for CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. The objective of the verification is to have an independent review ex-post determination by a Designated Operational Entity (DOE) of the monitored GHG emission reductions that have occurred as a result of the registered CDM project activity during a defined monitoring period. Certification is the written assurance by the DOE that, during a specific time period, a proposed CDM project activity achieved the GHG emission reductions as verified.

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;
- The GHG emission reductions data and express a conclusion with a reasonable level of assurance about whether the reported emission reductions data are free from material misstatement;
- The reported GHG emission data is sufficiently supported by evidence.

Verification shall ensure that reported emission reductions are complete and accurate in accordance with applicable UNFCCC criteria for CDM in order to be certified.

Verification process

Verification is conducted using RINA procedures in line with the requirements specified in the CDM Validation and Verification Standard, latest version available, relevant decisions of the CDM EB and applying standard auditing techniques. RINA assessed and determines that the implementation and operation of the project activity, and steps taken to report GHG emission reductions comply with the CDM criteria and relevant guidance provided by the Board. The verification assessment involved a document review of relevant documentation and the on-site visit. Verification is not meant to provide any consultancy towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the monitoring.

Conclusion

The World Bank has commissioned RINA to carry out the verification and certification of GHG emission reductions reported for the registered project activity "*Kainji Hydropower Rehabilitation Project, Nigeria*", UNFCCC Ref. No. 7726, for the monitoring period 01/01/2013 to 31/12/2017. The project was validated by AENOR (validation report reference n° 2009/018/CDM/04 version 3 of 20/12/2012) /42/ and it was registered on 28/12/2012. The GHG emission reductions were calculated based on the approved methodology ACM0002 version 12.3.0 of 02/03/2012 consolidated baseline methodology for grid-connected electricity generation from renewable sources /41/, and the monitoring plan included in the registered Project Design Document (PDD), version 03 of 20/12/2012 /2/.

In our opinion the GHG emission reductions reported for the project in the monitoring report version 02 of 31/01/2019 are fairly stated.

SECTION B. Verification team, technical reviewer and approver**B.1. Verification team member**

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Verification findings
1.	Team Leader	IR	VALOROSO	Rita	RINA Central Office	√	√	√	√
	Verifier								
	Technical Expert TA1.2								

B.2. Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	MENON	Rekha	India Office
2.	Approver	IR	SEVERINO	Laura	RINA HQ

SECTION C. Application of materiality**C.1. Consideration of materiality in planning the verification**

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Human error in the quantification of emissions (which may be more likely to occur if personnel are unfamiliar with, or not well trained regarding emissions processes or data recording).	Low	This is the 1 st monitoring period with 5 years length. The data collection is carried out by organized team: the coordinating officer is responsible for the scope and quality of the CDM team who has the responsibility for developing and implementing the monitoring process. The electricity generation data is monitored and recorded on hourly basis and then aggregated each day and every month. Monthly data are cross-checked against the electricity sales receipts. The records are archived in both paper and electronic format.	The verification team will verify the collection data process, the competency of personnel involved and will cross check the data with the final GHG emission reductions calculation. Through cross-check required on the transfer of data starting from the power house operator and ending to the project coordinating officer. Conduct increased sampling during the months where there is a greater likelihood of errors and issues with data quality control.
2.	Undue reliance on a poorly designed information system, which may have few effective quality controls.			
3.	Manual adjustment of otherwise automatically recorded activity levels.			

C.2. Consideration of materiality in conducting the verification

In order to detect errors, omissions and misstatements in emission reductions being claimed by the project participant in the monitoring report, the materiality have been applied by RINA as per the clause 9.1.2.3. *Application of materiality of the CDM VVS* for project activities /40/. The project is a large scale and a 2% materiality threshold is applied.

- (a) In planning the verification, RINA is able to understand the environment in which the project activity operated, the sources of project emissions and leakage within the project boundary, the monitoring activities, the equipment used to monitor or measured activity data, the origin and application of data used to calculate the emissions, data flow, the internal quality control system and the overall organization with respect to monitoring and reporting.
- (b) A verification plan and intensive sampling has been designed to minimize risks that a material discrepancy would not be detected. The use of spreadsheets shows adequate controls related to data updates, version tracking, and traceability and securing.
- (c) During the verification, any individual or aggregate errors, omission or misstatement identified, which resulted in discrepancies have been considered material and requested to be corrected.

Some errors in the calculation have been detected during the cross check of the meter reading field sheets and the emission reductions calculation spreadsheet; all of them have been corrected by PP, therefore RINA confirms the data set are free from material errors.

SECTION D. Means of verification

D.1. Desk/document review

The monitoring report version 02 of 31/01/2019 /1/ and previous version, the GHG emission reductions calculation provided in the form of a spreadsheet (ER Calculation_1st MP_Kainji-Nigeria_190131.xlsx) /3/, were assessed as part of the verification. In addition the PDD /2/, in particular the baseline estimations and the monitoring plan were reviewed. The monitoring report version 01 was made publicly available at the CDM UNFCCC website on 02/10/2018 (<http://cdm.unfccc.int/Issuance/MonitoringReports>). Appendix 3 of this report lists all documents reviewed during the verification including CDM regulatory documents.

D.2. On-site inspection

Duration of on-site inspection: 29/11/2018 to 30/11/2018				
No.	Activity performed on-site	Site location	Date	Team member
1.	Introduction about the project, history and background of the project, operational and management structure, project starting date and start of crediting period.	Kainji offices	29/11/2018	Rita VALOROSO
2.	Actual implementation and operation of the project activity.		29/11/2018	
3.	QA/QC procedures, records and storage data. Measuring instruments. ER calculation		29/11/2018	
4.	Closing meeting and communication of the assessment findings		30/11/2018	

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	ISMAIL	Mohammed	Mainstream Energy Solutions	29-30/11/2018	History and background of the project.	Rita VALOROSO
2.	MUFLAU	Alaya Gaba				
3.	ADEMYI	Sunday				
4.	UMAR SANI	Yusuf				
5.	OKOROHOL CE	Ejiro Matthew				
6.	BABATUNALE	James				
7.	OLADELE	Sunday Aderemi				
8.	GOLD	Pamela	The World Bank			
9.	CROCE	Claudia				
					Actual implementation and operation of the project activity.	
					QA/QC procedures.	
					Records and storage data.	
					Measuring instruments.	
					ER calculation.	

D.4. Sampling approach

NA

D.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form		1	
Compliance of the project implementation and operation with the registered PDD			
Post-registration changes			
Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines			
Compliance of monitoring activities with the registered monitoring plan		1	
Compliance with the calibration frequency requirements for measuring instruments			
Assessment of data and calculation of emission reductions or net removals		2	
Assessment of reported sustainable development co-benefits			
Global stakeholder consultation			
Others (please specify)			
Total		4	

SECTION E. Verification findings

E.1. Compliance of the monitoring report with the monitoring report form

Means of verification	Comparing the monitoring report /1/ with the monitoring report form provided by CDM EB listed in the UNFCCC website /38/.
Findings	<i>The PP names stated in the cover page and in table 3 of the monitoring report are not consistent with the ones stated in the UNFCCC project view page. CAR4. The CAR is closed, please refer to Appendix 4.</i>
Conclusion	The monitoring report version 02 submitted for verification process is in compliance with the latest MR form (version available at UNFCCC website) and with the instruction for completing the form therein.

E.2. Remaining forward action requests from validation and/or previous verifications

This is the first verification, and no forward action requests have been raised from validation /42/.

E.3. Compliance of the project implementation and operation with the registered project design document

Means of verification	<p>The project activity covers the rehabilitation of existing unit 5, 6 and 12 at the Kainji Hydropower powerhouse. Rehabilitation includes: installation of new turbines, new generators, new governors, and rehabilitation of auxiliary services (control system, new diesel generator, and new water supply, upgrading ventilation system) and upgrading of monitoring equipment. The facility, when it was fully commissioned, was equipped with 8 turbines (numbered 5 to 12) with a total installed capacity of 760 MW, while the rehabilitation of 5, 6 and 12 account to 340 MW. The rehabilitation was carried out in different phases and the related units were commissioned as following:</p>												
	<table><tr><th>Unit</th><th>MW</th><th>Commissioning date</th></tr><tr><td>1G5</td><td>120</td><td>26/05/2015 /13/</td></tr><tr><td>1G6</td><td>120</td><td>31/08/2015 /14/</td></tr><tr><td>1G12</td><td>100</td><td>13/05/2016 /15/</td></tr></table>	Unit	MW	Commissioning date	1G5	120	26/05/2015 /13/	1G6	120	31/08/2015 /14/	1G12	100	13/05/2016 /15/
Unit	MW	Commissioning date											
1G5	120	26/05/2015 /13/											
1G6	120	31/08/2015 /14/											
1G12	100	13/05/2016 /15/											
	<p>The hydro power plant is operated according the Water Use Licence /31/ Electricity</p>												

	generation licence /21/ and the concession agreement /16/. There is no deviation in the implementation or operation of the project activity compared to the registered project activity.
Findings	/
Conclusion	By mean of the on-site inspection, RINA has assessed that all physical features of the registered CDM project activity specified in the registered PDD are in place and confirms that the implementation and operation of the project activity has been conducted in accordance with the description contained in the registered PDD.

E.4. Post-registration changes**E.4.1. Temporary deviations from the registered monitoring plan, applied methodologies or applied standardized baselines**

NA

E.4.2. Corrections

NA

E.4.3. Change to the start date of the crediting period of the project activity

NA

E.4.4. Inclusion of a monitoring plan

NA

E.4.5. Permanent changes from registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other applied standards or tools

NA

E.4.6. Changes to the project design

NA

E.4.7. Changes specific to afforestation and reforestation project activities

NA

E.5. Compliance of the registered monitoring plan with the methodology including applicable tools and standardized baselines

Means of verification	During this monitoring period, the validated and registered monitoring plan was found to be in accordance with the applied methodology /41/.
Findings	/
Conclusion	By mean of reviewing the registered monitoring plan /2/ with the applied methodology /41/ RINA confirms that the registered monitoring plan is in accordance with the applied methodology.

E.6. Compliance of monitoring activities with the registered monitoring plan

The monitoring has been carried out in accordance with the monitoring plan contained in the registered monitoring plan /2/. The following table describe for each parameter which is to be measured according to the monitoring plan and how RINA has verified that the actual monitoring complies with the monitoring plan and that data have been assessed to correctly support the emission removals being claimed. Monitoring organization and responsibilities are identified in section C of the monitoring report /1/; the relevant responsibilities are for data collection process and quality assurance process.

In accordance with the CDM VVS /40/ RINA has assessed the information provided by the PP by: reviewing the data and information to verify their completeness, the registered monitoring plan /2/, the applied methodology /41/; evaluating the data management and the quality assurance and quality control of the reported emission reductions. The on-site inspection is also carried out to assess the implementation and operation of the registered project activity, review the information flows, interview the relevant personnel involved in the data collection procedures, cross-check the information in the monitoring report and the raw data, review of calculation and assumptions used for the GHG emission reductions calculation.

E.6.1. Data and parameters fixed ex ante or at renewal of crediting period

Means of verification	Data and parameters fixed ex-ante as listed in the monitoring report /1/ have been cross-checked and reviewed as applicable against the registered PDD and monitoring plan /2/, applied methodology /41/ and other relevant CDM documentation. The following list shows the default values used in this verification for ER calculation:		
	Parameter	Description	Value applied
	GWP _{CH4}	Global warming potential for methane. Not used.	21
	EG _{historical}	Historical average electricity generation by Kanji generation facility (in the absence of the CDM project activity, the existing facility would continue to provide electricity to the grid at historical average levels).	2,584,473 MWh/y
	σ _{historical}	Standard deviation of the annual average historical net electricity generation delivered to the grid by Kainji hydro power plant prior to the implementation of the project activity.	268,997 MWh/y
	DATE _{baseline retrofit}	Baseline retrofit date (the time at which the hydro generation facility would probably be replaced or retrofitted in the absence of the CDM project activity)	01/01/2026
	DATE _{hist}	Point in time from which the time span of historical data for retrofit may start.	2002
	EF _{grid, CM, y}	Nigerian grid emission factor for year 2006-2008.	0.59 tCO ₂ /MWh
Findings	/		
Conclusion	RINA confirms that the parameters listed above are fixed ex-ante and used for baseline, project and leakage emissions calculation in accordance with the applied methodology and methodological tools and they are the same used at the validation stage.		

E.6.2. Data and parameters monitored

Means of verification	The following is the only parameter required to be monitored during the monitoring period, with the evidences that has been correctly monitored during the actual monitoring and used for ERs calculation:
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	Parameter Value applied	Assessment
	EG_{facility,y} 4,493,369.382 MWh/y	Quantity of net electricity generation supplied by the power plant to the grid. Electricity generation is measured by electricity meters that record the energy exported and imported cumulatively and the reading is taken as the difference between the two. The data recorded and used in the ERs spreadsheet calculation /3/ have been cross-checked with the data from the internal MEMO grid energy meter reading /9/ of 25 months on 30 months of the monitoring period. The sample can be considered appropriate and permitted the conclusion about the accuracy in the ERs calculation. The energy consumption is calculated according the running hours of each unit and assigned proportionally /3/. The information flow is confirmed by review of the field sheet /36//37/and further by interviewing those in data keeping.
	<p>The CDM coordinating team is in charge for data collection and instrument calibration and on the monthly basis the results from the units are consolidated by the production department. People in charge in the monitoring activities are trained in order to ensure the accuracy of the monitoring /10/.</p> <p>There is no evidence of inapplicability of the monitoring methodology during the monitoring period as confirmed by the PP during the on-site visit and by the annual maintenance history logbook /34/.</p>	
Findings	<i>Explanation of the approach used for the energy consumption of each unit is calculated is requested. CAR1. The CAR is closed, please refer to Appendix 4.</i>	
Conclusion	RINA confirms that: <ul style="list-style-type: none"> - The registered monitoring plan has been properly implemented and followed by the PP; - All parameters stated in the registered monitoring plan have been monitored including baseline emissions as applicable; - The responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the registered monitoring plan; - Monitoring results are consistently recorded as per the approved frequency; - Quality assurance and quality control procedures have been applied in accordance with the registered monitoring plan; - The monitoring has been carried out in accordance with the registered monitoring plan. 	

E.6.3. Implementation of sampling plan

Means of verification	NA
Findings	NA
Conclusion	NA

E.7. Compliance with the calibration frequency requirements for measuring instruments

Means of verification	Three electricity meters are installed for measuring the electricity generation; each unit is equipped with the own electricity meter.			
	Unit	Meter sn	Accuracy	Calibration
	1G5	212372608	0.2	Last calibration 25/05/2015
	1G6	212372442	0.2	Last calibration 31/08/2015
	1G12	212372553	0.2	Last calibration 13/05/2015
The accuracy is the same stated by the electricity meter manufacturer specification				

	/17/ and the last calibration is represented by the date when the units were commissioned /13-14-15/. The calibration frequency and responsibility is regulated by Nigeria metering code /27/, the PP is not allowed to conduct the calibration.
Findings	
Conclusion	RINA confirms that the measuring equipment are maintained according the national metering code.

E.8. Assessment of data and calculation of emission reductions or net removals

E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

Means of verification	<p>The calculation of baseline emissions has been carried out in accordance with the requirements of the applied methodology /41/. RINA cross-checked information provided in the monitoring report with data from electricity generation monthly report for the actual monitoring period. The baseline emissions are calculated according the following formula:</p> $BE_y = EG_{\text{facility},y} * EF_{\text{grid,CM},y}$ <p>The baseline emissions account to 2,651,087 tCO₂e.</p>
Findings	<p><i>The emission reductions calculation considers year 2013 when the first rehabilitated unit is commissioned on 25/05/2015. CAR2. The CAR is closed, please refer to Appendix 4.</i></p> <p><i>The first date to be considered in the calculation shall be the date when the units have been commissioned: for all the three units the calculation take into account all the month when were commissioned without taking into account the completion date. CAR2. The CAR is closed, please refer to Appendix 4.</i></p>
Conclusion	RINA confirms that the calculation of baseline emissions has been carried out in accordance with the formulae and methods described in the registered monitoring plan and applied methodology.

E.8.2. Calculation of project GHG emissions or actual net anthropogenic GHG removals by sinks

Means of verification	According the applied methodology as the project activity is a renewable power generation project, the project emissions are zero. Due to the presence of diesel generator, project emissions are estimated taking into account the consumption rate per hour stated by the manufacturer /45/ and the running hours during the monitoring period /44/. Applying the methodological tool to calculate project or leakage emissions from fossil fuel combustion /46/, the project emissions due to diesel generator account to 91 tCO ₂ e which represents 0,0034% of the total emission reductions, thus it can be considered negligible /3/.
Findings	<i>Project emissions of diesel generators are not monitored and taken into account in the emission reductions calculation. CAR3. The CAR is closed, please refer to Appendix 4.</i>
Conclusion	RINA confirms that the calculation of project emissions has been carried out in accordance with the formulae and methods described in the registered monitoring plan and applied methodology, considering the conservative estimation.

E.8.3. Calculation of leakage GHG emissions

Means of verification	No leakage emissions are involved in the project activity.
Findings	/
Conclusion	/

E.8.4. Summary calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

Means of verification	The emission reductions are calculated in accordance with the requirements of the applied methodology /41/ and correctly reported in the monitoring plan /2/ and spreadsheet calculation /3/. The total amount of emission reductions is equal to baseline emissions: 2,651,087 tCO ₂ e.
Findings	/

Conclusion	RINA confirms: <ul style="list-style-type: none"> - All the data and parameters were monitored in accordance with the registered monitoring plan; - The data reported in the spreadsheet were cross-checked with the data recorded in the monthly reports and the values reported in the monitoring report were verified against the data presented in the spreadsheet; - The calculation of emission reductions has been carried out in accordance with the formulae and methods described in the registered monitoring plan and applied methodology; - Default values have been applied in the calculation in accordance to the registered PDD.
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E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	The emission reductions with the ex-ante estimation in the registered PDD accounts for the monitoring period to 4,336,017 tCO ₂ while the emission reductions with the ex-post calculation accounts to 2,651,087 tCO ₂ e.
Findings	/
Conclusion	The actual emission reductions are lower than the expectations stated in the registered PDD.

E.8.6. Remarks on difference from estimated value in registered PDD

Means of verification	NA
Findings	NA
Conclusion	NA

E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Means of verification	The PP defined the monitoring period 01/01/2013 – 31/12/2017, but the ERs have been calculated from the commissioning dates of each unit. Therefore the energy generation previous the commissioning dates is not considered for the ERs calculation.
Findings	
Conclusion	No emission reductions are accounted during the first commitment period.

E.9. Assessment of reported sustainable development co-benefits

Means of verification	NA
Findings	NA
Conclusion	NA

E.10. Global stakeholder consultation

Means of verification	This is the first monitoring period and the monitoring report was publicly available at the CDM UNFCCC website on 02/10/2018.
Findings	/
Conclusion	RINA confirms that no comments were received during this period.

SECTION F. Internal quality control

The draft final verification report before being submitted to the client will be subjected to an independent internal technical review to confirm that all the verification activities had been completed according to the pertinent RINA instructions.

The technical review will be performed by a technical reviewer qualified in accordance with RINA's qualification scheme for CDM validation and verification.

SECTION G. Verification opinion

RINA Services S.p.A. (RINA) has performed the verification of the emission reductions reported for the project activity "Kainji Hydropower Rehabilitation Project, Nigeria", CDM Reference No. 7726 for the period from 01/01/2013 to 31/12/2017 (both days included) with regard to the relevant requirements for CDM activities. The project participants are responsible for the preparation for the collection of data in accordance with the monitoring plan and the reporting emission reductions from the project. It is RINA's responsibility to express an independent verification opinion on the reported emission reductions from the project. Based on the documented evidence and corroborated by an on-site assessment RINA can confirm that:

- The project has been implemented and operated as per the registered PDD;
- The monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable CDM requirements;
- The monitoring complies with the monitoring plan in the registered PDD;
- The monitoring plan in the registered PDD is as per the applied baseline and monitoring methodology.

SECTION H. Certification statement

It is RINA's opinion that the GHG emission reductions stated in the monitoring report version 02 of 31/01/2019 for the Kainji Hydropower Rehabilitation Project, Nigeria, for the period from 01/01/2013 to 31/12/2017 (both days included) are fairly stated. The GHG emission reductions were calculated on the basis of the approved monitoring methodology ACM0002 version 12 – Consolidated baseline methodology for grid-connected electricity generation from renewable sources, and the monitoring plan contained in the registered PDD. Hence RINA is able to certify that the emission reductions from the project during the stated monitoring period amount to 2,651,087 tCO₂e.

Appendix 1. Abbreviations

Abbreviations	Full texts
BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM M&P	Modalities and Procedures CDM
CDM PCP	Clean Development Mechanism Project Cycle Procedure
CDM PS	Clean Development Mechanism Project Standard
CDM VVS	Clean Development Mechanism Validation Verification Standard
CER(s)	Certified Emission Reduction(s)
CL	Clarification Request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
ERs	Emission Reduction(s)
FAR	Forward Action Request
FMNR	Farmer Managed Natural Regeneration
GIS	Geographic Information System
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MR	Monitoring Report
NA	Not Applicable
PDD	Project Design Document
PE	Project emission
PP(s)	Project Participant(s)
QA/QC	Quality Assurance / Quality Control
RINA	RINA Services S.p.A.
SS	Sectoral Scope
TA	Technical Area
TBD	To Be Defined
UNFCCC	United Nations Framework Convention on Climate Change

Appendix 2. Competence of team members and technical reviewers



CERTIFICATO DI QUALIFICA QUALIFICATION CERTIFICATE

Si attesta che il sig./sig.ra:
We declare that Mr/Mrs/Ms:

Rita VALOROSO

è qualificato come1:
is qualified as:

CDM -TEC, -VAL, -VER, -TL
TECHNICAL REVIEWER, REG-EXP²

per le seguenti aree tecniche:
for the following technical areas:

1.2, 3.1, 13.1, 14.1

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.2	Renewables	1
3.1	Energy demand	3
13.1	Solid Waste and waste water	13
14.1	Afforestation and reforestation	14

in accordo alle istruzioni della Divisione Certificazione.
in accordance with the instructions of the Certification Division.

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	18-01-2010	-
11	20-07-2018	Update qualification REG-EXP
12	18-10-2018	Update qualification TA 14.1

Il Resp. CCPLS
Head of CCPLS

¹ Legend:

VAL: Validator
VER: Verifier
TEC: Technical Expert
TL: Team Leader
FIN-EXP: Financial Expert
DET: Determiner

CDM: Clean Development Mechanism
VCS: Verified Carbon Standard
GS: Gold Standard
SCS: Social Carbon Standard
JI: Joint Implementation

² Asia / Central Asia and Pacific region; Iran, Pakistan, Qatar; Cameroon, Congo, Ethiopia, Ghana, Madagascar, Mozambique, Niger, Nigeria, Tunisia, Uganda, South Africa, Egypt; South America; Albania, Bosnia-Herzegovina, Georgia, Macedonia.

RINA Services S.p.A. è accreditato da UNFCCC, quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM, da VCSA per condurre la Validazione e la Verifica di Progetti VCS, da GS Foundation, per condurre la Validazione e la Verifica di Progetti GS, da Ecologica Institute per condurre la Validazione e la Verifica di rapporti SCS

RINA Services S.p.A. is accredited by the UNFCCC, as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects, by the VCSA, to carry out Validation and Verification of VCS Projects, by the GS Foundation, to carry out Validation and Verification of GS Projects and by the Ecologica Institute, to carry out Validation and Verification of SCS Reports



**CERTIFICATO DI QUALIFICA
QUALIFICATION CERTIFICATE**

Si attesta che il sig./sig.ra:
We declare that Mr/Mrs/Ms:

Rekha MENON

è qualificato come¹:
is qualified as:

**CDM-TEC, -VAL, -VER, -TL
ITRP, REG-EXP²**

per le seguenti aree tecniche:
for the following technical areas:

1.2, 2.1, 13.1, 13.2, 14.1

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.2	Renewables	1
2.1	Energy Demand	2
13.1	Solid Waste and wastewater	13
13.2	Manure	13
14.1	Afforestation and reforestation	14

in accordo alle istruzioni dell'unità Sostenibilità & Cambiamenti Climatici.
in accordance with the instructions of the Sustainability & Climate Change Unit.

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	06-03-2008	-
11	31-03-2017	Update qualification as ITRP
12	23-07-2018	Update qualification as REG-EXP

Il Resp. CCPLS
Head of CCPLS

¹ Legend:

VAL: Validator
VER: Verifier
TEC: Technical Expert
TL: Team Leader
FIN-EXP: Financial Expert
DET: Determiner

CDM: Clean Development Mechanism
VCS: Verified Carbon Standard
GS: Gold Standard
SCS: Social Carbon Standard
JI: Joint Implementation

² India, Indonesia, Malaysia, Myanmar, Vietnam, Cambodia, Laos, Sri Lanka, Nepal, China, Philippines, Thailand, Africa, Latin America and Iran

RINA Services S.p.A. è accreditato da UNFCCC, quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM, da VCSA per condurre la Validazione e la Verifica di Progetti VCS, da GS Foundation, per condurre la Validazione e la Verifica di Progetti GS, da Ecologica Institute per condurre la Validazione e la Verifica di rapporti SCS

RINA Services S.p.A. is accredited by the UNFCCC, as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects, by the VCSA, to carry out Validation and Verification of VCS Projects, by the GS Foundation, to carry out Validation and Verification of GS Projects and by the Ecologica Institute, to carry out Validation and Verification of SCS Reports

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Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	Mainstream Energy Solutions	Monitoring Report: Kainji Hydropower Rehabilitation Project, Nigeria.	Version 01 of 26/09/2018 Version 02 of 31/01/2019	PP
2	Power Holding Company of Nigeria (PHCN)	PDD: Kainji Hydropower Rehabilitation Project, Nigeria.	Version 03 of 20/12/2012	PP
3	Mainstream Energy Solutions	Emission reductions calculation: ER Calculation_1st MP_Kainji-Nigeria_180926 ER Calculation_1st MP_Kainji-Nigeria_190131.xlsx	Version of 26/09/2018 Version of 31/01/2019	PP
4	Hydrochina Huadong – HEC Consortium	Automatic System Operating and Maintenance Manual For Unit 12	NGKJ-CBA-FM-01-002 rev. A of 12/09/2015	PP
5	Harbin Electric Machinery Company Limited	Excitation System Maintenance Instruction	NGKJ-MKC-FM-01-017 rev. A of 22/09/2015	PP
6	Hydrochina Huadong – HEC Consortium	Governor operating and maintenance manual	NGKJ-MEU-FM-01-006/A rev. A of 02/07/2015	PP
7	SMEC International (Pty) Ltd.	Environmental and Social Impact Study Report for the Rehabilitation of Kainji and Jebba Hydropower Stations.	Final revision of 23/09/2016	PP
8	Hydrochina Huadong – HEC Consortium	Updated acceleration work schedule for KAINJI HEPP	18/04/2015	PP
9	Mainstream Energy Solutions	Internal MEMO Grid energy meter reading for the months of: April 2016, April 2017, August 2016, August 2017, December 2015, December 2016, December 2017, February 2016, February 2017, January 2016, January 2017, July 2016, July 2017, June 2016, June 2017, March 2016, March 2017, May 2017, May 2016, November 2016, November 2017, October 2016, October 2017, September 2016, September 2017,	02/05/2016, 01/05/2017, 01/09/2016, 29/08/2017, 01/01/2016, 01/01/2017, 01/01/2018, 01/03/2016, 01/03/2017, 01/02/2016, 01/02/2017, 01/08/2016, 01/08/2017, 01/07/2016, 01/07/2017, 01/04/2016, 01/04/2017, 01/06/2017, 01/06/2016, 01/12/2016, 01/12/2017, 01/11/2016, 01/11/2017, 01/10/2016,	PP

			01/10/2017,	
10	Mainstream Energy Solutions	Attendance sheet training carried out on 25/04/2018	25/04/2018	PP
11	Mainstream Energy Solutions and Bureau of Public Enterprises (BPE)	Certificate of handover of Kainji Hydro Electric Plc to Mainstream Energy Solution Ltd.	01/11/2013	PP
12	Transmission Company of Nigeria	Certification of 12 No. Trading point energy meters at Kainji Power Station, Kainji, Niger State.	16/07/2018	PP
13	Power Holding Company of Nigeria PLC	Completion Certificate Unit G5: completion date 25/05/2015	27/05/2016	PP
14	Power Holding Company of Nigeria PLC	Completion Certificate Unit G6: completion date 31/08/2015	27/05/2016	PP
15	Power Holding Company of Nigeria PLC	Completion Certificate Unit G12: completion date 13/05/2016	27/05/2016	PP
16	Kainji Hydro Electric PLC, and Mainstream Energy Solutions and Bureau of Public Enterprises (BPE)	Concession agreement relating to the Kainji and Jebba Hydro Electric Power Plants Nigeria.	21/02/2013	PP
17	EDMI	Meter specification: MK6E Smart Three Phase Electronic Revenue Meter	/	PP
18	EDMI	MK6E Energy meter – User Manual	03/11/2004	PP
19	Federal Republic of Nigeria	Official Gazette: Electric power sector reform Act. 2005	08/08/2005	PP
20	Federal Ministry of Environment	Environmental audit statement and certificate	23/08/2016 Expiry date 22/08/2019	PP
21	Nigerian Electricity Regulatory Commission	Electricity Generation Licence	NERC/LC/097of 01/10/2013 Expiry date 30/09/2023	PP
22	Mainstream Energy Solutions to Transmission Company of Nigeria	Invitation for certification of energy meters at Kainji Hydro Power Plant	MESL/HQ/MDTCN/1.1/ 070/2018 of 09/05/2018	PP
23	Mainstream Energy Solutions	Generation data gathering	/	PP
24	Nigerian Bulk Electricity Trading PLC and Kainji Hydroelectric PLC	Bulk power purchase agreement	21/02/2013	PP
26	Corporate affairs commission Federal Republic of Nigeria	Certificate of Incorporation	28/02/2011	PP
27	Nigerian Electricity Regulatory Commission	Nigeria Metering code	Version 02	PP
28	Federal Republic of Nigeria	National Energy Policy	April 2003	PP
29	Nigerian Electricity management Services Agency	Re-certification of the trading point energy meters in Kainji Hydro Power Plant	16/10/2018	PP
30	Kainji Hydroelectric PLC and	Novation Agreement	April 2016	PP

	Mainstream Energy Solutions			
31	Federal Ministry of Water Resources	Water Use Licence	No. FMWR/L/CA2/002 of 30/09/2013 Expiry date 29/09/2043	PP
32	Federal Ministry of Environment	Industrial/domestic wastewater discharge permit	SAE 029 of 31/05/2016	PP
33	Mainstream Energy Solutions	Running hours logbook: 1G5, 6 & 12 Running hours.xlsx	/	PP
34	Mainstream Energy Solutions	Annual maintenance history logbook: Annual Maintenance History .xlsx	/	PP
36	Mainstream Energy Solutions	Energy generation 2013-2017 logbook: Energy Generation 2013-2017.xlsx	/	PP
37	Mainstream Energy Solutions	Kainji Plant data logbook: Kainji Plant Data - 2015.xlsx Kainji Plant Data - 2016.xlsx Kainji Plant Data - 2017 .xlsx	/	PP
38	CDM Executive Board	Monitoring report form for CDM project activity (CDM-MR-FORM)	Version 06.0 of 07/06/2017	Others
39	CDM Executive Board	CDM project standard for project activities	Version 02.0 of 29/11/2018	Others
40	CDM Executive Board	CDM validation and verification standard for project activities.	Version 02.0 of 29/11/2018	Others
41	CDM Executive Board	ACM0002 Consolidated baseline methodology for grid-connected electricity generation from renewable sources.	Version 12.3.0 of 02/03/2012	Others
42	AENOR	CDM Validation report	2009/018/CDM/04 version 3 of 20/12/2012	Other
43	Mainstream Energy Solutions	Engine Perkins 4012-46TWG2A, 1.25MVA - pictures diesel generator	/	PP
44	Mainstream Energy Solutions	Running Hour of 1.25MVA Diesel Generator.xlsx	Version of 31/01/2019	PP
45	Perkins	Technical data sheet diesel engine 4012-46TWG2A	/	PP
46	CDM Executive Board	Methodological tool to calculate project or leakage CO2 emissions from fossil fuel combustion.	Version 03.0 del 22/09/2017.	Other

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. Remaining FAR from validation and/or previous verifications

FAR ID	xx	Section no.	E.2	Date: DD/MM/YYYY
Description of FAR				
Project participant response				Date: DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				Date: DD/MM/YYYY

Table 2. CL from this verification

CL ID	xx	Section no.	Date: DD/MM/YYYY
Description of CL			
Project participant response			Date: DD/MM/YYYY
Documentation provided by project participant			
DOE assessment			Date: DD/MM/YYYY

Table 3. CAR from this verification

CAR ID	1	Section no.	E.6.2	Date: 22/12/2018
Description of CAR				
<i>Explanation of the approach used for the energy consumption of each unit is calculated is requested.</i>				
Project participant response				Date: 31/01/2019
<p><i>Considering that the data for energy consumption available is for the whole plant (1G5 to 1G12, units) and there is data for the operation of each unit, the PP has divided the total energy consumption proportionally to the running hours of each unit considered by the project activity (unit 5, 6 and 12).</i></p> <p><i>The above explanation has been included in section E.1 of the amended MR and the calculation can be seen in the sheet "Operational time" of the amended ER Calculation Sheet "ER Calculation_1st MP_Kainji-Nigeria_190131.xlsx"</i></p>				
Documentation provided by project participant				
<i>"ER Calculation_1st MP_Kainji-Nigeria_190131.xlsx" - Sheet "Operational time"</i>				
DOE assessment				Date: 31/03/2019
The approach adopted by the PP can be accepted since there is the evidence of the running hours of each unit and the total energy consumption is assigned proportionally /3/. The CAR is closed.				

CAR ID	2	Section no.	E.8.1	Date: 22/12/2018
Description of CAR				
<p><i>The emission reductions calculation considers year 2013 when the first rehabilitated unit is commissioned on 25/05/2015.</i></p> <p><i>The first date to be considered in the calculation shall be the date when the units have been commissioned: for all the three units the calculation take into account all the month when were commissioned without taking into account the completion date.</i></p>				
Project participant response				Date: 31/01/2019
<p><i>According to the commissioning certificates, the generation unit 5, 6 and 12 were commissioned on 25/05/2015, 31/08/2015 and 13/05/2016, respectively. The ER Calculation (ER Calculation_1st MP_Kainji-Nigeria_190131.xlsx) has been amended to conservatively not consider the energy generation previous to the commissioning dates. The resulting ERs have been updated in the amended version of the MR.</i></p>				
Documentation provided by project participant				
<i>ER Calculation_1st MP_Kainji-Nigeria_190131.xlsx</i>				
DOE assessment				Date: 31/03/2019
The ERs calculation /3/ is updated considering the energy generation form the commissioning dated of each unit. The actual ERs account to 2,651,087 tCO ₂ e. The CAR is closed.				

CAR ID	3	Section no.	E.8.2	Date: 22/12/2018																																																																
Description of CAR																																																																				
Project emissions of diesel generators are not monitored and taken into account in the emission reductions calculation.																																																																				
Project participant response				Date: 31/01/2019																																																																
<p>There is a diesel generator installed in the plant (Engine Perkins 4012-46TWG2A, 1.25MVA see pictures in folder "Annexes") to operate in emergency conditions, which was replacing an old one at the rehabilitation. The diesel generator has only been operated 96.84 hours (see "Running Hour of 1.25MVA Diesel Generator.xlsx") during the monitoring period considered at an estimated consumption rate of 288 litres/hr (see fuel consumption in page 21/24 of the technical specifications "Engine Perkins_4012-46TWG2A.pdf" in folder "Annexes").</p> <p>The project emissions from fossil fuel combustion in process j (PEFC,j) have been calculated (see "Project Emissions from Diesel Generator.xlsx" as per the version 03.0 of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" as follows: $PEy=PEFC,j = FCj,y * NCVj,y * EF_{CO2,i}$</p> <p>Obtaining the following results:</p> <table border="1"> <thead> <tr> <th rowspan="3">From</th> <th rowspan="3">To</th> <th>Ex Post</th> <th>Ex Post</th> <th>Ex Ante</th> <th>Ex Ante</th> <th rowspan="3">PEy</th> </tr> <tr> <th>Hrs</th> <th>FCj,y</th> <th>NCVj,y</th> <th>EF CO2,i</th> </tr> <tr> <th>Running hours of diesel generator</th> <th>Quantity of fuel type i combusted in process j (Diesel)</th> <th>Weighted average net calorific value of the fuel type i</th> <th>Weighted average CO2 emission factor of fuel type (Diesel)</th> </tr> <tr> <th></th> <th></th> <th>(hours)</th> <th>(m3)</th> <th>GJ/m3</th> <th>tCO2/GJ</th> <th>(t CO2e)</th> </tr> </thead> <tbody> <tr> <td>01/01/2013</td> <td>31/12/2013</td> <td>-</td> <td>-</td> <td>43.300</td> <td>0.0748</td> <td>-</td> </tr> <tr> <td>01/01/2014</td> <td>31/12/2014</td> <td>-</td> <td>-</td> <td>43.300</td> <td>0.0748</td> <td>-</td> </tr> <tr> <td>01/01/2015</td> <td>31/12/2015</td> <td>-</td> <td>-</td> <td>43.300</td> <td>0.0748</td> <td>-</td> </tr> <tr> <td>01/01/2016</td> <td>31/12/2016</td> <td>68.33</td> <td>19.67904</td> <td>43.300</td> <td>0.0748</td> <td>64</td> </tr> <tr> <td>01/01/2017</td> <td>31/12/2017</td> <td>28.51</td> <td>8.21088</td> <td>43.300</td> <td>0.0748</td> <td>27</td> </tr> <tr> <td>01/01/2013</td> <td>31/12/2017</td> <td>96.84</td> <td>27.88992</td> <td>43.300</td> <td>0.0748</td> <td>91</td> </tr> </tbody> </table> <p>Considering that the 91 tCO2 only account for the 0.0034% of the total emission reductions, the PP considers that the project emissions are negligible. Moreover, since the diesel generator was replacing an old one at the rehabilitation (page 7 of PDD), it is considered that similar project emissions would have happened at the baseline scenario and as such were not included in the project boundary at validation.</p>					From	To	Ex Post	Ex Post	Ex Ante	Ex Ante	PEy	Hrs	FCj,y	NCVj,y	EF CO2,i	Running hours of diesel generator	Quantity of fuel type i combusted in process j (Diesel)	Weighted average net calorific value of the fuel type i	Weighted average CO2 emission factor of fuel type (Diesel)			(hours)	(m3)	GJ/m3	tCO2/GJ	(t CO2e)	01/01/2013	31/12/2013	-	-	43.300	0.0748	-	01/01/2014	31/12/2014	-	-	43.300	0.0748	-	01/01/2015	31/12/2015	-	-	43.300	0.0748	-	01/01/2016	31/12/2016	68.33	19.67904	43.300	0.0748	64	01/01/2017	31/12/2017	28.51	8.21088	43.300	0.0748	27	01/01/2013	31/12/2017	96.84	27.88992	43.300	0.0748	91
From	To	Ex Post	Ex Post	Ex Ante			Ex Ante	PEy																																																												
		Hrs	FCj,y	NCVj,y			EF CO2,i																																																													
		Running hours of diesel generator	Quantity of fuel type i combusted in process j (Diesel)	Weighted average net calorific value of the fuel type i	Weighted average CO2 emission factor of fuel type (Diesel)																																																															
		(hours)	(m3)	GJ/m3	tCO2/GJ	(t CO2e)																																																														
01/01/2013	31/12/2013	-	-	43.300	0.0748	-																																																														
01/01/2014	31/12/2014	-	-	43.300	0.0748	-																																																														
01/01/2015	31/12/2015	-	-	43.300	0.0748	-																																																														
01/01/2016	31/12/2016	68.33	19.67904	43.300	0.0748	64																																																														
01/01/2017	31/12/2017	28.51	8.21088	43.300	0.0748	27																																																														
01/01/2013	31/12/2017	96.84	27.88992	43.300	0.0748	91																																																														
Documentation provided by project participant																																																																				
Engine Perkins 4012-46TWG2A, 1.25MVA - pictures Running Hour of 1.25MVA Diesel Generator.xlsx Engine Perkins_4012-46TWG2A.pdf																																																																				
DOE assessment				Date: 31/01/2019																																																																
Project emissions from diesel generator are estimated taking into account the consumption rate per hour stated by the manufacturer /45/ and the running hours during the monitoring period /44/. Applying the methodological tool to calculate project or leakage emissions from fossil fuel combustion /46/, the project emissions due to diesel generator account to 91 tCO2e which represents 0,0034% of the total emission reductions, thus it can be considered negligible /3/. The CAR is closed.																																																																				

CAR ID	4	Section no.	E.1	Date: 22/12/2018
Description of CAR				
The PP names stated in the cover page and in table 3 of the monitoring report are not consistent with the ones stated in the UNFCCC project view page.				
Project participant response				Date: 31/01/2019
Enel Trade S.p.A. has been replaced by Enel Global Trading S.p.A.				
Documentation provided by project participant				
Monitoring Report version 02 of 31/01/2019.				
DOE assessment				Date: 31/03/2019
The monitoring report version 02 /1/ is updated accordingly. The CAR is closed.				

Table 4. FAR from this verification

FAR ID	xx	Section No.		Date: DD/MM/YYYY
Description of FAR				
Project participant response				Date: DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				Date: DD/MM/YYYY

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
02.1	11 January 2018	Editorial revision to correct the numbering of appendices in the instructions.
02.0	31 October 2017	Revision to align with the requirements of the “CDM validation and verification standard for project activities” (version 01.0).
01.0	23 March 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: project activities, verifying and certifying		