


FINAL VERIFICATION REPORT

“210 MW MUSI HYDRO POWER PLANT, BENGKULU”



Document Prepared By RINA Services S.p.A. (RINA)

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Out By

Summary:

RINA Services S.p.A. (RINA), commissioned by South Pole Carbon Asset Management Ltd., verified the greenhouse gas emission reductions reported for the project activity “210 MW Musi Hydro Power Plant, Bengkulu” in Indonesia, VCS Registration Reference N° 487, for the period 01/08/2016 to 30/09/2017 with regard to the relevant requirements for VCS activities.

The objective of the verification is to have an independent review ex-post determination of the monitored reductions in GHG emission reductions, Verification was conducted using RINA procedures in line with the requirements specified in the VCS Version 3.7 Requirements, CDM M&P, the latest version of the CDM Validation and Verification Standard, and relevant decisions of the COP/MOP and the CDM EB and applying standard auditing techniques. The verification consisted of desk review, on-site assessment and the resolution of outstanding issues and the issuance of the final verification report and certification

The verification shall ensure that reported emission reductions are complete and accurate in accordance with applicable VCS / CDM requirements in order to be certified.

The project was validated by RINA (validation report N° 2009 IQ ME 132 of 16/11/2009) and it was registered under the VCS registration reference N° 487. The renewal of crediting period is again validated by RINA (validation report N° 2017 IQ MD 53 of 05/03/2018).

The GHG emission reductions were calculated on the basis of the approved methodology ACM0002 ‘Consolidated methodology for grid-connected electricity generation from renewable resources’ version 17 of 13/05/2016 and the monitoring plan included in the registered Project Design Document, version 3 of 28/02/2018.

During the verification process 1 Corrective Action Request (CAR) was identified related to the monitoring, implementation or operations of the proposed VCS project activity in relation to all relevant VCS requirements for the project activity and the applied baseline and monitoring methodology; The same has been successfully closed and described in this report.

In conclusion, it is RINA’s opinion that the project activity “ 210 MW Musi Hydro Power Plant, Bengkulu” in Indonesia, VCS project ID 487, meets all relevant requirements for VCS standard and guidelines and correctly applies the baseline and monitoring methodology ACM0002 ‘Consolidated methodology for grid-connected electricity generation from renewable resources’ version 17 of 13/05/2016. The monitoring system is in place and the emission reductions are calculated without material misstatement. Hence, RINA is able to certify that the emission reductions from the project during the monitoring period 01/08/2016 to 30/09/2017 amount to 841,084 tCO₂e.

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1 INTRODUCTION

1.1 Objective

RINA has been commissioned by “South Pole Carbon Asset Management Ltd.” to perform an independent verification of its VCS project, “210 MW Musi Hydro Power Plant, Bengkulu”, already registered under VCS with Project ID. 487 for the reported GHG emission reductions for the given monitoring period 01/08/2016 up to 30/09/2017. The VCS projects must undergo independent third party verification and certification of emission reductions as the basis for issuance of Voluntary Emission Reductions (VERs/VCUs).

The objectives of this verification exercise are, by review of objective evidence, to establish that:

- The project activity has been implemented and operated as per the project description (PD) and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- Monitoring report and other supporting documents are complete;
- The data is recorded and stored as per the monitoring methodology and approved monitoring plan.
- To confirm that the monitoring system is implemented and fully functional to generate Voluntary Emission Reductions (VERs/VCUs) without any double counting, and

To establish that the data reported are accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation.

1.2 Scope and Criteria

The verification scope is:

- to verify that 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 project is assessed against the requirements of VCS version 3.7 and related rules and guidance. RINA has, based on the recommendations in the latest version of CDM Validation and Verification Standard, and employed a rule-based approach (as criteria) in the verification, focusing on the identification of significant reporting rules and the reliability of project monitoring.

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.

1.3 Level of Assurance

All the revisions of the verification report before being submitted to the client were subjected to an independent internal technical review to confirm that all verification activities had been completed according to the pertinent RINA instructions, with reasonable level of assurance.

The technical review was performed by a technical reviewer(s) qualified in accordance with RINA's qualification scheme for VCS and CDM validation and verification.

The verification team and the technical reviewers consist of the following personnel.

Role	Last Name	First Name	Country
Team Leader, verifier & Technical Expert (TA 1.2)	Buragohain	Champok	India
Technical reviewer	Liu	Huifeng	China

1.4 Summary Description of the Project

The project is a 210 MW capacity, grid connected, run off river type hydroelectric power generating unit. It is located in Bengkulu Province about 30 km northeast of Bengkulu city, the capital of the Province. It involves the inter-basin transfer of water from the Musi river in Rejang Lebong Regency to the Simpangaur river in North Bengkulu Regency through a 7.5 km long waterway and has an underground powerhouse.

The project activity involves generation of electricity by harnessing the hydrological resources of the Musi river and supply it to the Sumatra grid through the Pekalongan PLN main station, with a 150 kV transmission line. This in turn reduces the power supplied to the grid using fossil fuels that results in GHG emission to the atmosphere. Hence this project activity reduces the GHG emissions. The project has three units with 70 MW capacity each. Start date of the project is 19 July 2006 as per the commissioning certificate of all three units /14/. The electricity exported to grid is continuously monitored in three dedicated energy meters based on which the emission reduction is calculated.

As per the registered VCS PD (VCS Ref. No: 487) of the VCS project, baseline emissions are calculated as the product of net electricity export and grid emission factor which is in line with the applied methodology. Project emissions from firing fossil fuel (diesel) in generators for emergency power supply in the project activity is neglected as per paragraph 38 of the applied methodology. The emission reduction is calculated as the difference of baseline emissions and the project emissions as the leakage emissions are considered to be negligible for the project activity as per the applied methodologies.

The total emission reduction for this 1st verification period (under second crediting period) from 01/08/2016 to 30/09/2017 is 841,084 tCO_{2e}. The emission reductions are calculated conservatively as per the applied methodologies.

Main components of the project activity include three turbines and its generators, transmission lines, grid interconnection points and DG sets.

The main information of the project activity is summarized in the table below:

Project Participant(s)	PT. PLN (Persero) South Pole Carbon Asset Management Ltd.		
Project Title	210 MW Musi Hydro Power Plant, Bengkulu		
Location of the project	The project area of the Musi Hydroelectric Power Plant is situated in Bengkulu Province about 30 km northeast of Bengkulu city, the capital of the Province. It involves the inter--basin transfer of water from the Musi river in Rejang Lebong Regency to the Simpangaur river in North Bengkulu Regency through a 7.5 km long waterway and an underground powerhouse. The geographical coordinate of Musi Hydroelectric Power Plant is located on 3.618497 South Latitude and 102.457186 East Longitude.		
Methodology(ies)	ACM0002 'Consolidated methodology for grid-connected electricity generation from renewable resources' version 17 of 13/05/2016		
Sectoral Scope(s)	01	RINA's Technical Area(s)	1.2
Registered PDD	Version 3 of 09/11/2009 and version 03 of 28/02/2018		
Starting date of the crediting period	19/07/2006 (under first crediting period) 01/08/2016 (under second crediting period)		
Project's crediting period	01/08/2006 – 31/07/2016 (under first crediting period_ 01/08/2016 – 31/07/2026 (under second crediting period)		
Current monitoring period	01/08/2016 to 30/09/2017		
Project documentation link	http://www.vcsprojectdatabase.org/#/project_details/487		

2 VERIFICATION PROCESS

2.1 Method and Criteria

Verification was conducted using RINA procedures in line with the requirements specified in the VCS Requirements, i.e. VCS Program Guide, VCS Version 3 (v3.7) and VCS Standard, VCS Version 3 (v3.7). The GHG emission reductions are on the basis of the approved Baseline and monitoring methodology ACM0002 'Consolidated methodology for grid-connected electricity generation from renewable resources' version 17 of 13/05/2016.

The verification consisted of the following three phases

- Document review;
- On-site assessment including Interviews and Site Inspections;
- Resolution of Any Material Discrepancy and the issuance of the final verification report and certification.

The following sections outline each step in more detail.

2.2 Document Review

The monitoring report (MR) version 01 of 12/12/2017 and version 02 of 22/03/2018 **/01/**, the emission reduction calculations spreadsheet (171211_Musi_ER Calculation_2016-2017 v1.0_Isa.xlsx) version 01 of 12/12/2017 and version 02 (180320_Musi_ER Calculation_2016-2017 v2.0_Isa.xlsx) of 22/03/2018 **/03/**, were assessed as part of the verification. In addition the registered Project Design Document (VCS-PD) **/02/** in particular the baseline estimations and the monitoring plan for the project were reviewed.

The following table lists the documentation that was reviewed during the verification

/01/	South Pole Carbon Asset Management Ltd.: VCS monitoring report for the project activity “210 MW Musi Hydro Power Plant, Bengkulu”, version 1.0 of 12/12/2017 and version 02 of 22/03/2018
/02/	South Pole Carbon Asset Management Ltd.: VCS project description for project activity “210 MW Musi Hydro Power Plant, Bengkulu” in Indonesia, version 3 of 09/11/2009 and version 03 of 28/02/2018
/03/	South Pole Carbon Asset Management Ltd.: Emission Reduction spread sheet titled “171211_Musi_ER Calculation_2016-2017 v1.0_Isa.xlsx” version 01 of 12/12/2017 and version 02 (180320_Musi_ER Calculation_2016-2017 v2.0_Isa.xlsx) of 22/03/2018
/04/	VCS: VCS Program Guide, VCS Version 3 (v3.7), Requirements Document of 21/06/2017
/05/	VCS: VCS Standard, VCS Version 3 (v3.7), Requirements Document of 21/06/2017
/06/	CDM Executive Board: ACM0002 ‘Consolidated methodology for grid-connected electricity generation from renewable resources’ version 17 of 13/05/2016
/07/	Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan: Calibration certificates for energy meters
/08/	VCS: Monitoring report form (MONITORING REPORT: VCS Version 3) , version 03.4 dated 19/10/2016
/09/	RINA: Validation report (validation report N° 2009 IQ ME 132 of 16/11/2009) for the project activity “210 MW Musi Hydro Power Plant, Bengkulu” RINA: Validation report on renewal of crediting period (2017-IQ-53-MD) version 1.0Aa dated 05/03/2018
/10/	VCS: 210 MW Musi Hydro Power Plant, Bengkulu (ID: 487) http://www.vcsprojectdatabase.org/#/project_details/487
/11/	RINA: Verification report for the project activity ‘210 MW Musi Hydro Power Plant, Bengkulu’ covering the monitoring period 01/04/2013 to 31/07/2016
/12/	PT PLN (Persero): Data transfer energi PT. PLN (PERSERO) KITSBS SEKTOR BENGKULU DAN PT. PLN (PERSERO) P3BS UPT BENGKULU from 01/08/2016 to 30/09/2017
/13/	Bengkulu Province Tax Office (local government): Monthly water tax receipts for the power generation from Musi Hydro Power from August 2016 to September 2017
/14/	Department of Energy, Indonesia: Copy of commissioning certificate dated 19/07/2006

/15/	Governor of Bengkulu: Environmental worthiness certificate for 210 MW Musi Hydro Power Project dated 25/08/2004
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2.3 Interviews

The key personnel interviewed and the main topics of the interviews are summarized in the table below:

	Date	Name and Role	Organization	Topic
/a/	20/12/2017	Leonardo Sidabalok- Project Manager	South Pole Carbon Asset Management Ltd.	Monitoring report, emission reduction calculations, records of monitoring parameters, VCS rules, application of methodology etc.
/b/	20/12/2017	Pirwan- Assistant Manager	PT. PLN (Persero)	Technical aspects of the project activity. Operational life, environmental aspects etc.
/c/	20/12/2017	Akhmad Juari – SPV operation and planning control		
/d/	20/12/2017	Iwan Rosario S.- Supervisor of Environmental safety of electricity (LK2)	PT. PLN (Persero)	Operational details of the project, management structure, legal compliance, health, safety and environmental aspects, data monitoring and recording procedure, safety practices, production controls, internal audits etc.
/e/	20/12/2017	Restian Rahman- Health safety & environment		
/f/	20/12/2017	Syaifa Laila Sany- Inventory Control		

2.4 Site Inspections

On 20/12/2017, RINA visited the project site. During the on-site assessment of the project, there were no hindrance and all the equipment's and the systems were accessible. RINA assessed the implementation and operation of the proposed project activity, reviewed the information flows for generating, aggregating and reporting the monitoring parameters, interviewed key personnel of the plant to confirm the operational and data collection procedures, cross-checked between information provided in the monitoring report and data plant, checked the monitoring equipment, reviewed calculations and assumptions made in determining the GHG data and emission reductions, checked the quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

2.5 Resolution of Findings

The objective of this phase of the verification is to resolve any outstanding issues which need to be clarified for RINA's positive conclusion on the project description. To guarantee transparency a verification protocol has been customized for the project. The protocol shows in a transparent manner the requirements, means of verification and the results from verifying the identified criteria. The verification protocol consists of three tables; the different columns in these tables are described in the figure below (see Figure 1). The completed verification protocol is enclosed in Appendix B to this report.

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

- Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
- Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impair the estimate of emission reductions;
- Issues identified in a FAR during validation to be verified during verification have not been resolved by the project participants.

A clarification request (CR) is raised if information is insufficient or not clear enough to determine whether the applicable VCS requirements, which refer to CDM rules, have been met.

In summary, during the verification process, 1 CAR was identified which has been successfully closed.

2.5.1 Forward Action Requests

Based on the review of the validation report on renewal of crediting period /09/, no FAR found raised.

2.6 Eligibility for Validation Activities

The project activity is registered under VCS registration reference Number 487 /10/, hence this section is not applicable.

3 VALIDATION FINDINGS

The project was validated by RINA (2017-IQ-53-MD) version 1.0Aa of 05/03/2018 and it was registered under the VCS registration reference No-487. This is the 1st verification assessment under the second monitoring period covering period 01/08/2016 to 30/09/2017 by RINA.

3.1 Participation under Other GHG Programs

N/A.

3.2 Methodology Deviations

N/A.

3.3 Project Description Deviations

N/A.

3.4 Grouped Project

This project is not a grouped project. Hence, this section is not applicable.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

On the basis of the on-site visit and the reviewed project documentation, the verification team confirms that the project was implemented as described in the registered VCS PD. All the physical components and project boundary are in conformity with the description in registered VCS PD. The project activity was commissioned in July 2006 and in operation since then. Based on the VCS PD and the available information at VCS database it is confirmed that the project's first crediting period is from 01/08/2006 to 31/07/2016 and issuance of VERs covering monitoring period from 01/04/2009 to 31/03/2010, from 01/04/2010 to 31/03/2013 and from 01/04/2013 to 31/07/2016 are already certified.

Based on document review and onsite verification, it is confirmed that all the emission sources within the boundary have been considered appropriately. Monitoring of all parameters during the monitoring period is followed as per registered monitoring plan.

Data parameters fixed ex-ante and available at validation are given below:

DATA/PARAMETER Unit	Source of data	Reported value for the project period	Assessment/Observation
Grid Emission Factor (EF _{grid,CM,y}) in tCO ₂ e/MWh	Data based on registered PD /02/ and validation report /09/	0.857	The value is ex-ante fixed for the next crediting period (01/08/2016 – 31/07/2026) as per the registered PD, which has been justified and validated by validation DOE to follow the applied methodology and tool /02/, /09/.

RINA is able to confirm that the Data and parameters fixed ex ante have been implemented in full compliance with the registered monitoring plan.

Data parameters monitored:

Data/Parameter	Assessment																									
Data Unit	EG _{P,J,y} ; kWh																									
Description	Net electricity supplied to the grid by the project activity during the year 'y'																									
Source of data to be used	Measured by main electricity meter (Actaris type SL 7000) at the project activity site (the switch yard). Electricity Generation (EG) data used for monitoring is the monthly electricity generation delivered to grid summarized in Electricity Transfer Protocol Report signed by both parties of Generation department and Transmission department.																									
Value of monitored parameter for the monitoring period	981,430 MWh. The values mentioned in the monitoring report and ER sheet have been verified from monthly generation reports /12/. Further, the reported monthly values are cross checked from water tax receipts and found to be correct /13/.																									
Monitoring equipment	<table border="1"> <thead> <tr> <th colspan="5">Energy meter</th> </tr> <tr> <th></th> <th>Unit 1</th> <th>Unit 2</th> <th>Unit 3</th> <th>Import meter</th> </tr> </thead> <tbody> <tr> <td>Sl. No.</td> <td>36027156</td> <td>36027159</td> <td>36027158</td> <td>35008966</td> </tr> <tr> <td>Model</td> <td>Actaris</td> <td>Actaris</td> <td>Actaris</td> <td>Actaris</td> </tr> <tr> <td>Accuracy</td> <td>0.2s</td> <td>0.2s</td> <td>0.2s</td> <td>0.2s</td> </tr> </tbody> </table>	Energy meter						Unit 1	Unit 2	Unit 3	Import meter	Sl. No.	36027156	36027159	36027158	35008966	Model	Actaris	Actaris	Actaris	Actaris	Accuracy	0.2s	0.2s	0.2s	0.2s
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Model	Actaris	Actaris	Actaris	Actaris																						
Accuracy	0.2s	0.2s	0.2s	0.2s																						
Accuracy of the monitoring equipment	As per the registered VCS PD version 03 of 28/02/2018, the accuracy class of energy meters installed at plant is of accuracy class 0.2s. Verification team has checked the same during the site visit and confirmed that the accuracy class of main meters are of 0.2s.																									
Measuring/Reading/Recording frequency	Continuous monitoring and monthly recording. The practice found to be followed during site visit and consistent with registered monitoring plan.																									
Calculation method (if applicable)	N/A.																									
Calibration																										

<p>Calibration frequency/interval Is the calibration interval in line with the monitoring plan of the PD?</p>	<p>Once in five years as per National Regulation from the Energy and Mineral Resources Ministry Number 37 in 2008.</p>																							
<p>Does the calibration cover the monitoring period? Has the calibration frequency been respected?</p>	<p>The monitoring period is from 01/08/2016 to 30/09/2017. Calibration details of energy meters are given below:</p> <table border="1" data-bbox="732 443 1377 1087"> <thead> <tr> <th>Sl. No.:</th> <th>Date of calibration</th> <th>Validity</th> </tr> </thead> <tbody> <tr> <td rowspan="2">36027156</td> <td>06/07/2012</td> <td>06/07/2017</td> </tr> <tr> <td>25/10/2016</td> <td>25/10/2021</td> </tr> <tr> <td rowspan="2">36027159</td> <td>06/07/2012</td> <td>06/07/2017</td> </tr> <tr> <td>26/10/2016</td> <td>26/10/2021</td> </tr> <tr> <td rowspan="2">36027158</td> <td>08/07/2012</td> <td>08/07/2017</td> </tr> <tr> <td>26/10/2016</td> <td>26/10/2021</td> </tr> <tr> <td rowspan="2">35008966</td> <td>06/07/2012</td> <td>06/07/2017</td> </tr> <tr> <td>26/10/2016</td> <td>26/10/2021</td> </tr> </tbody> </table> <p>Therefore, the calibration of energy meter covers the monitoring period. The calibration frequency of the meter has been checked with calibrations records and found that the calibration frequency has been respected.</p>	Sl. No.:	Date of calibration	Validity	36027156	06/07/2012	06/07/2017	25/10/2016	25/10/2021	36027159	06/07/2012	06/07/2017	26/10/2016	26/10/2021	36027158	08/07/2012	08/07/2017	26/10/2016	26/10/2021	35008966	06/07/2012	06/07/2017	26/10/2016	26/10/2021
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<p>Calibration certificates</p>	<table border="1" data-bbox="732 1251 1430 1810"> <thead> <tr> <th>Meter no.</th> <th>Calibration details</th> </tr> </thead> <tbody> <tr> <td>36027156</td> <td>Calibrated by Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan on 06/07/2012 and on 25/10/2016 /07/</td> </tr> <tr> <td>36027159</td> <td>Calibrated by Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan on 06/07/2012 and on 26/10/2016 /07/</td> </tr> <tr> <td>36027158</td> <td>Calibrated by Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan on 08/07/2012 and on 26/10/2016 /07/</td> </tr> <tr> <td>35008966</td> <td>Calibrated by Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan on 06/07/2012 and on 26/10/2016 /07/</td> </tr> </tbody> </table>	Meter no.	Calibration details	36027156	Calibrated by Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan on 06/07/2012 and on 25/10/2016 /07/	36027159	Calibrated by Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan on 06/07/2012 and on 26/10/2016 /07/	36027158	Calibrated by Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan on 08/07/2012 and on 26/10/2016 /07/	35008966	Calibrated by Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan on 06/07/2012 and on 26/10/2016 /07/													
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35008966	Calibrated by Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan on 06/07/2012 and on 26/10/2016 /07/																							

Does the calibration of meters have been done by an accredited person or institution?	Laboratorium Kalibrasi- PT. PLN (Persero) Penelitian dan Pengembangan Ketenagalistrikan has been accredited by the National Accreditation Committee (Komite Akreditasi Nasional / KAN) with certificate number of LK--007--IDN for Laboratory of Calibration /07/
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4.2 Accuracy of GHG Emission Reduction and Removal Calculations

GHG emissions reductions for the project and the baseline scenario were correctly calculated using the formulae described in the applied methodology for this project. The verification team has reviewed the emission reduction (ER) spread sheet and checked all the formulae and found they are correct and in line with the monitoring plan of the registered PD and the applied monitoring methodology.

The emission reductions are estimated by measuring the required parameters using appropriate monitoring equipment and using the formulae described in the methodologies; ACM0002, version 17 and the VCS PD. All the ex-ante parameters which are used in the calculation of emission reduction are presented in section 4.1 of this report. It is confirmed that all the ex-ante parameters have been correctly used in the emission reduction calculation. According to the applied methodologies, the conservativeness of the achieved emission reduction was checked and the calculation has been transparently provided in the ER sheet.

Baseline Emissions:

Baseline emissions is calculated as below:

$$BE_y = EG_{P,J,y} \times EF_{grid,CM,y}$$

Where,

$EG_{P,J,y}$: Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh/yr)

$EF_{grid,CM,y}$: Combined margin CO₂ emission factor for grid connected power generation in year y (tCO₂/MWh)

The representatives of both Musi HEPP and transmission unit record the main meter readings on a monthly basis and a report is prepared based on this readings. This report is named as the monthly electricity transfer protocol report and is signed by the representatives of Musi HEPP and the transmission department /12/. The value of $EG_{P,J,y}$ is taken from this report and amounts to 981,430 MWh for the period from 01/08/2016 to 30/09/2017. The verification team has checked the monthly electricity transfer protocol reports for each month of the said period and confirmed that the value mentioned above is in line with the monthly electricity transfer protocol reports /12/. Further, the reported values are cross checked from monthly water tax receipts and confirm to be correct /13/.

The combined margin emission factor was fixed ex ante and was calculated based on "tool to calculate emission factor for an electricity system". The value fixed ex ante is 0.857 (tCO₂/MWh) /02/.

Therefore, BE_y for the monitoring period from 01/08/2016 to 30/09/2017 is 841,084 tCO_{2e}.

Project Emissions:

N/A.

Leakage emissions: As per the methodology ACM0002 “Consolidated baseline methodology for grid connected electricity generation from renewable sources”, version 17, no leakage emission is considered.

Emission Reductions:

Therefore, overall emission reductions achieved from the project activity during the monitoring period is **841,084 tCO₂e**.

4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

During the verification site visit, all relevant documents were checked to assess the correctness and quality of data submitted by the project participants, which are used to determine emission reductions. Monthly electricity generation reports, water tax receipts were verified to ensure that there is no over estimation of the VCUs. The provided data was found to be of adequate quality.

All records needed for monitoring are archived in line with the requirements of the registered monitoring plan. No significant, lack of evidence and missing data were detected during onsite verification. Hence, the verification team confirms that the monitoring system ensures required quality of the monitoring system to ensure the quality of the monitored data. All internal data are subjected to QA/QC measures.

All the meters were calibrated at appropriate calibration frequency (described in section 4.1) to ensure the quality of the data.

It was verified through onsite interviews that the plant’s team involved in the monitoring of project activity is well experienced. Hence, the verification team concludes that competent staff is employed by the project proponent to carry out the relevant tasks with sufficient accuracy.

RINA is of the opinion that this method of estimation is accurate and results in conservative estimation of emission reduction and is line with the applicable VCS requirements.

4.4 Non-Permanence Risk Analysis

There is no non-permanence risk rating determined by the project proponent.

5 SAFEGUARDS

5.1 No Net Harm

The project activity received environmental clearance from government /15/. In terms of EIA requirement, the project activity has been taking all measures required during operational phase. Therefore, there is no net harm from the project activity.

5.2 Local Stakeholder Consultation

Local stakeholder consultation is not applicable for the project proponent during verification. PP organized stakeholder consultation during validation of the project activity which was validated by the validation agency/09/. RINA has interacted local stakeholders during this verification site visit and details are summarized in section 2.3 of this report. There was no negative comment or feedback from local stakeholders as recorded by RINA during site visit.

6 VERIFICATION CONCLUSION

RINA Service Spa (RINA) has performed verification of the emission reductions reported for the project activity “210 MW Musi Hydro Power Plant, Bengkulu” in Indonesia, VCS Registry Project ID 487, for the period 01/08/2016 to 30/09/2017, with regard to the relevant requirements for VCS activities. The project participants of the “210 MW Musi Hydro Power Plant, Bengkulu” project are responsible for:

- the preparation of greenhouses gas emissions data and the reported greenhouse gas emission reductions from the project on the basis set out in the monitoring plan contained in the registered project design document version 3 of 28/02/2018
- the development and maintenance of records and reporting procedures in accordance with that plan, including the calculation and determination of greenhouse gas emission reductions of the project.

It is the responsibility of RINA to express an independent verification opinion about the project's conformity with the requirements of VCS Standard version 3 and GHG program applied, on the reported greenhouse gas emission reductions from the project.

Based on documented evidence and corroborated by an on-site assessment RINA can confirm that:

- the project has been implemented and operated as per the registered VCS-PD;
- the monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable VCS Standard version 3 requirements;
- the monitoring is in place as per the applied baseline and monitoring methodology;
- the monitoring plan in the registered VCS-PD is as per the applied baseline and monitoring methodology.

It is RINA's opinion that the GHG emission reduction stated in the monitoring report version 02 of 22/03/2018 for the “210 MW Musi Hydro Power Plant, Bengkulu” in Indonesia for the period 01/08/2016 to 30/09/2017 are fairly stated. The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology ACM0002 ‘Consolidated methodology for grid-connected electricity generation from renewable resources’ version 17 of 13/05/2016 and the monitoring plan contained in the registered VCS-PD.

Hence RINA is able to certify that the emission reduction from the project during the monitoring period 01/08/2016 to 30/09/2017 is amount to 841,084 tCO₂e.

Verified GHG emission reductions and removals in the above verification period:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
01/08/2016 to 31/12/2016	287,901	0	0	287,901
01/01/2017 to 30/09/2017	553,183	0	0	553,183
Total	841,084	0	0	841,084

APPENDIX A: ABBREVIATIONS

Abbreviations	Full texts
BE	Baseline Emissions
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM M&P	Modalities and Procedures CDM
CER(s)	Certified Emission Reduction(s)
CH ₄	Methane
CR	Clarification Request
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
CRT	Coordination and Technical Control Staff
DCI	Certification Division of RINA Services Spa
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EF	Emission Factor
ER	Emission Reductions
FAR	Forward Action Request
GHG(s)	Greenhouse gas(es)
GWP	Global Warming Potential
HFO	Heavy Fuel Oil
IPCC	Intergovernmental Panel on Climate Change
LoA	Letter of Approval
MoV	Means of Verification
MR	Monitoring Report
NGO	Non-governmental Organization
ODA	Official Development Assistance
PDD	Project Design Document

PE	Project Emission
PP(s)	Project Participant(s)
Ref.	Document Reference
RINA	RINA Services Spa
SS(s)	Sectoral Scope(s)
TA(s)	Technical Area(s)
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCU	Verified Carbon Unit
VER	Voluntary Emission Reductions
VVS	Validation and Verification Standard

APPENDIX B: CLARIFICATION REQUESTS, CORRECTIVE ACTION REQUESTS AND FORWARD ACTION REQUEST

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

FAR ID	xx	Section no.	2.5.1	Date: DD/MM/YYYY
Description of FAR				
<i>No remaining FAR to be addressed.</i>				
Project participant response				Date: DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				Date: DD/MM/YYYY

Table 2. CR from this verification

CR ID		Section no.		Date: DD/MM/YYYY
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Description of CR	
<i>No CR raised.</i>	
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	01	Section no.	4.1	Date: 10/01/2018
Description of CAR				
<p><i>a) Calibration details of energy meter used for in house consumption is not provided in the MR.</i></p> <p><i>b) Calibration details provided in the MR does not cover the monitoring period. Please clarify.</i></p>				
Project participant response				Date: 22/03/2018
<p><i>a) Calibration details of energy meter used for in house consumption has been provided in the MR section 3.2 and 3.3.3.</i></p> <p><i>b) Calibration details provided in the MR have been added so that cover the monitoring period.</i></p>				
Documentation provided by project participant				
<p><i>a) 161026_Calibration report_Own consumption.pdf</i></p> <p><i>b) 180322_Musi_2nd CP_1st ver_Monitoring Report_v2.0_Isa.doc</i></p>				
DOE assessment				Date: 02/04/2018
Calibration details of the in house consumption meter is provided and copy of the calibration certificate confirm the same. Also the MR is corrected in consistent with ER sheet for reported values of BE _y and EG _{pj,y} . Hence, response is accepted and CAR is closed.				

Table 4. FAR from this verification

FAR ID	xx	Section No.		Date: DD/MM/YYYY
Description of FAR				
<i>No FAR raised during this verification.</i>				
Project participant response				Date: DD/MM/YYYY
Documentation provided by project participant				
DOE assessment				Date: DD/MM/YYYY



CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

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

Champok Buragohain

è qualificato come:
 is qualified as:

TEC, VAL, VER, TL, ITR, Local Expert

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

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.2	Renewables	1
2.1	Electricity distribution	2
13.1	Solid waste and wastewater	13
13.2	Manure	13

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)
1	11/07/2017	Qualification update

Responsabile di schema
 Scheme Leader
 Laura SEVERINO

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

TEC: Technical expert; VAL: Validator; VER: Verifier; TL: Team leader; FIN EXP: Financial Expert; ITRP: Independent technical reviewer

RINA Services S.p.A. è accreditato/riconosciuto da
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UNFCCC	quale Entità Operativa Designata (DOE), per condurre la Validazione e la Verifica di Progetti CDM as Designated Operational Entity (DOE), to carry out Validation and Verification of CDM Projects
VCSA	per condurre la Validazione e la Verifica di Progetti VCS to carry out Validation and Verification of VCS Projects
GS Foundation	per condurre la Validazione e la Verifica di Progetti GS to carry out Validation and Verification of GS Projects
Ecologica Institute	per condurre la Validazione e la Verifica di rapporti SCS to carry out Validation and Verification of SCS Reports
American Carbon Registry ACR	per condurre la Validazione e la Verifica di Progetti ACR to carry out Validation and Verification of ACR projects
The Climate, Community & Biodiversity Alliance CCB	per condurre la Validazione e la Verifica di Progetti co-benefit CCB to carry out Validation and Verification of co-benefit CCB projects



CERTIFICATO DI QUALIFICA PER GLI SCHEMI VOLONTARI*
QUALIFICATION CERTIFICATE FOR VOLUNTARY SCHEMES*

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

Hui Feng Liu

è qualificato come:
 is qualified as:

TEC, VAL, VER, TL, ITRP

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

AREE TECNICHE TECHNICAL AREAS	DESCRIZIONE DELL'AREA TECNICA TECHNICAL AREA DESCRIPTION	SCOPO SETTORIALE SECTORAL SCOPE
1.1	Thermal energy generation	1
1.2	Renewables	1
8.1	Mining and mineral processes	8
9.2	Iron, steel and Ferro alloy production	9
13.1	Solid waste and wastewater	13

REVISIONE REVISION	DATA DATE	MOTIVAZIONI PER LA REVISIONE REASON FOR THE REVISION
0	19/07/2016	First issue with new template (this certificate is linked to CDM qualification)

Responsabile di schema
 Scheme Leader
 Rita Valoroso

*SCHEMI VOLONTARI/ VOLUNTARY SCHEMES: ACR American Carbon Registry, CCB The Climate, Community & Biodiversity Alliance, GS Gold Standard, JI Joint Implementation, SCS Social Carbon Standard, VCS Verified Carbon Standard.

TEC: Technical expert; VAL: Validator; VER: Verifier; TL: Team leader; FIN EXP: Financial Expert; ITRP: Independent technical reviewer

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VCSA	per condurre la Validazione e la Verifica di Progetti VCS <i>to carry out Validation and Verification of VCS Projects</i>
GS Foundation	per condurre la Validazione e la Verifica di Progetti GS <i>to carry out Validation and Verification of GS Projects</i>
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The Climate, Community & Biodiversity Alliance CCB	per condurre la Validazione e la Verifica di Progetti co-benefit CCB <i>to carry out Validation and Verification of co-benefit CCB projects</i>