VERIFICATION REPORT

SONG ONG HYDROPOWER PROJECT

South Asia

Document Prepared By

TÜV SÜD South Asia Private Limited

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Prepared By	TÜV SÜD South Asia Pvt. Ltd.
Contact	Solitaire, 4th floor, ITI Road, Aundh, Pune, India
Approved By	Deepankar Chowdhury, Quality Manager, TÜV SÜD South Asia Pvt. Ltd.
Work Carried Out By	Shruti Kudtarkar (Assessment Team Leader & Verifier) Janvi Hirani (Trainee Verifier) Sudheedra K (Technical reviewer)

Summary:

TÜV SÜD South Asia Pvt. Ltd. has been appointed by "Song Ong Hydropower Joint Stock Company" to perform the 3rd periodic verification of the "Song Ong Hydropower Project" under VCS standard and guideline version 4.4. The objective of this verification activity is to have an independent third party for the assessment of the project design, monitoring report and Final Verification report and to ensure a thorough assessment of the proposed project activity against the applicable CDM and VCS requirements. No uncertainties in this verification has been observed

The 1st crediting period of the VCS is from 24/03/2009 to 23/03/2019[1].The Verification has been conducted for the monitoring period 01/03/2018 to 23/03/2019. The project is initially listed under CDM with a reference number 4117 with the renewable crediting period from 01 Mar 11 - 28 Feb 18. It has gone through one verification from 01 Mar 2011 - 29 Feb 2012 in CDM. Meanwhile, the project has transitioned from CDM to VCS where the CP of VCS was from 24 March 2009 to 28 February 2011 (considering 24 March 2009 as the commissioning date.

The verification process includes three phases:

- Desk review of documents.
- Off-site audit and follow-up interviews with the relevant personnel.
- Resolution of outstanding issues and the issuance of final verification report and opinion.

The scope of the verification is the independent and objective review of the monitoring report (MR). The MR is reviewed against the relevant criteria and decisions by the CDM Executive Board and VCS

[1] Deviation has been taken in the verification period from 01/03/2012 to 28/02/2018.10 years crediting period has been chosen for this project activity which can be renewed twice as per the deviation.

executive board, including the approved baseline and monitoring methodology. The verification was based on the guidance given in the VCS Validation and Verification Standard for the project activities, version 3.2, review against registered PD and Final Validation report, VCS Project Standard for project activities, version 4.4.

The project activity is located on Ong River in Quang Son commune, Ninh Son district in Ninh Thuan province. The project activity involves the construction of a dam, an intake, tunnels, a penstock, a pressurized well, a powerhouse and a discharge channel in order to convert potential flowing energy from the stream into clean electrical energy.

The Song Ong Hydropower Project involves the construction of a hydropower plant with 3 units, which is located on Ong River in Quang Son commune, Ninh Son district in Ninh Thuan province of Vietnam. The project's installed capacity and estimated annual gross power generation are 8.1 MW and 40,500 MWh, respectively. The projects generates and to supply renewable electricity to the national grid under the Power Purchase Agreement (PPA) signed with the Electricity Corporation of Vietnam (EVN). The net electricity generated from this project (annual estimated volume is 39,994 MWh) which supplies to the national grid via a transformer has output in the range of 22 to 25.2 kV.

The implementation of the project achieves CO_2 emission reduction by replacing electricity generated by fossil fuel fired power plants.

10 Clarification Requests (CLs) and 0 CARs have been raised during verification process has been successfully closed. No Forward Action Request (FAR) was raised during this monitoring period.

VVB confirms that the project is implemented in accordance with the registered VCS-PD. The monitoring plan complies with the applied methodology AMS I.D., version-16 and the monitoring has been carried out in accordance with the monitoring plan in the registered PDD. The monitoring system is in place and the emission reductions are calculated without material misstatements. The level of assurance of the verification is reasonable. Our opinion relates to the projects GHG emissions, and the resulting GHG emission reductions reported and related to the valid and registered project baseline and monitoring and its associated documents. Based on the information reviewed and evaluated, VVB confirms that the implementation of the project has resulted in 19,366 tCO_2e emission reductions during the monitoring period 01/03/2018 to 23/03/2019.

The verification has been planned and organized to achieve a Reasonable Level of assurance as per the requirement of VCS. No sampling procedure applied for site visit or document verifications. The entire documents checked/plant verification conducted to arrive at positive verification conclusions.

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1 INTRODUCTION

1.1 Objective

TÜV SÜD has been commissioned by the client to perform an independent verification assessment.
The objective of the verification work is to comply with the requirements of Verified Carbon Standards requirements. According to this assessment TÜV SÜD shall:

- ✓ Ensure that the project activity has been implemented and operated as per the registered PD, and that all physical features (technology, project equipment, monitoring, and metering equipment) of the project are in place,
- ✓ Ensure that the published MR and other supporting documents provided are complete, verifiable and in accordance with applicable VCS requirements,
- ✓ Ensure that the actual monitoring systems and procedures comply with the monitoring systems and procedures described in the monitoring plan and the approved methodology,
- ✓ Evaluate the data recorded and stored as per the applicable requirements.
- ✓ Assessment of the sustainability monitoring parameters as per the VCS requirements.

1.2 Scope and Criteria

The scope of any assessment is defined by the underlying legislation, regulation and guidance given by relevant entities or authorities. In the case of VCS project activities, the scope is set by:

- ✓ VCS Standard and Guidelines V 4.4.
- ✓ Baselines and monitoring methodologies (including GHG inventories).
- ✓ Current technical and operational knowledge of the specific sectoral scope and information on best practice.
- ✓ Stakeholder consultation and feedback

The verification is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the Monitoring report. In line with Guidelines for Application of materiality in verifications, the verification team has conducted a complete verification of all the information presented in the monitoring report and data monitored as presented in the emission reduction calculation spread sheet. It invoices follows the paper trail back to the raw data such as meter reading records and invoices. There are no material errors,

overestimation of ER, omission or misstatement. The verification team has reviewed all the documents like commissioning certificates, Joint Balance Sheet, invoices etc.

1.3 Level of Assurance

The errors identified in the project are below the threshold limit of materiality and hence not material. The GHG emission reductions are calculated without material misstatements.

The VVB confirms that a reasonable level of assurance has been achieved during the verification process.

1.4 Summary Description of the Project

The Song Ong Hydropower Project involves the construction of a hydropower plant with 3 units, which is located on Ong River in Quang Son commune, Ninh Son district in Ninh Thuan province of Vietnam. The project's installed capacity and estimated annual gross power generation are 8.1 MW and 40,500 MWh, respectively. The project's generates and to supply renewable electricity to the national grid under the Power Purchase Agreement (PPA) signed with the Electricity Corporation of Vietnam (EVN). The net electricity generated from this project (annual estimated volume is 39,994 MWh) which supplies to the national grid via a 22 kV line which connects the plant with the Ninh Son 110/22 kV transformer station.

The project activity involves the construction of a dam, an intake, tunnels, a penstock, a pressurized well, a powerhouse and a discharge channel in order to convert potential flowing energy from the stream into clean electrical energy.

The construction of Song Ong Hydropower plant was started in late of 2005 and finished in March 2009. On 05-March-2009, the test run was conducted, and plant started supplying electricity to the national grid on 24-March-2009. The geographical coordinates of the dam & water intake of the project are 1. Water Intake: Longitude of 108°48′ 19″ and Latitude of 11°45′ 13″ & 2. Powerhouse: Longitude of 108°49′ 20″ and Latitude of 11°44′ 56″.

The project activity generates renewable power with negligible Greenhouse Gas (GHG) emissions, which displaces electricity otherwise supplied by fossil fuel fired power plants. The monthly reading protocol signed between the project owner and the EVN is the data source and serves as evidence for calculation of emission reduction. During the current monitoring period, a total of 19,369 tCO_2e have been avoided.

The assessment team has checked the verification records and interviewed the PPs representatives (telephonically) to verify the project details. Based on the assessment of the documents and remote interviews with PPs representatives, the assessment team is able to confirm that the project activity is fully functional and implemented.

2 VERIFICATION PROCESS

2.1 Method and Criteria

The information provided by the project participants is assessed by applying the means of verification specified in the VCS standard and guideline, version 4.4 and the Validation and Verification Manual 3.2.

A competent assessment team is selected prior to the start of the verification. The team is selected to cover the technical area(s), sectoral scope(s) and relevant host country experience for evaluating the VCS project activity. Additionally, a competent Technical Reviewer or Technical Reviewer Team is appointed to conduct checks on quality and completeness.

The verification team performs first a desk review, followed by a remote-site visit, which results in the formation of a draft report and a list of findings. The next step involves the evaluation of the findings through direct communication with the PPs and then finally the preparation of the verification report. This verification report and other supporting documents then undergo an internal quality control by the CB "Environment and energy" before submission to the VCS.

2.2 Document Review

The documents referred during this verification are provided in Appendix 1.

2.3 Interviews

The VVB has conducted the remote-site inspection for this current monitoring. However, the VVB has ensured that reasonable level of assurance has been achieved as per Verra regulations on the relaxation of mandatory site visits by the VVB. The VVB has conducted Remote audit, telephonic interviews, and video calls to discuss with the client regarding the data and documents pertaining to the current verification period. The interviews and discussions were conducted successfully.

No.	Interviewee			Company Name	Date	Subject	Team member
	Last name	First name	Designation				
1.	Mr. Le Van	Khiem	Plant Manager -	Song Ong Hydropower Joint Stock Company	20/04/2023	Plant technology & instruments details and monitoring.	Shruti Kudtarkar Janvi Hirani
2	Ms. Vuong Thi Phuong	Giang	Administrator & Accountant	Song Ong Hydropower Joint Stock Company	20/04/2023	Plant technology, Local Stakeholder consultation and monitoring.	Shruti Kudtarkar Janvi Hirani
3	Mr. Vo Minh	Tram	Operator -	Song Ong Hydropower Joint Stock Company	20/04/2023	Monitoring Plan & plant technology.	Shruti Kudtarkar Janvi Hirani
4	Mr. Bui Van	Thuong	Operator -	Song Ong Hydropower Joint Stock Company	20/04/2023	Monitoring Plan & plant technology.	Shruti Kudtarkar Janvi Hirani
5	Tam	Nguyen Van	farmer	Local Villager	20/04/2023	To discuss grievance against the project as a part of on going feedback mechanism	Shruti Kudtarkar Janvi Hirani
6	Lien	Bui Thi	Fruit seller	Local Villager	20/04/2023	To discuss grievance against the project as a part of on going feedback mechanism	Shruti Kudtarkar Janvi Hirani
7	Hien	Thi Dang	Fruit seller	Local Village	20/04/2023	To discuss grievance against the project as a part of on going feedback mechanism	Shruti Kudtarkar Janvi Hirani
8	Tam	Nguyen Van	Farmer	Local Villager	20/04/2023	To discuss grievance against the project as a part of on going feedback mechanism	Shruti Kudtarkar Janvi Hirani
5	Mr. Le Quang	Linh	Consultant	EKI Energy Services Limited	20/04/2023	Monitoring Report, Crediting period, and ER calculations.	Shruti Kudtarkar Janvi Hirani

2.4 Site Visits

The Verification Audit was conducted on 20/04/2023. The audit was conducted remotely. Assessment team checked the implementation of the project, Baseline emission, Emission reduction calculation, technical description of the project and Monitoring. Assessment team also checked that whether the monitoring plan as described in the VCS PD is actually practised onsite. Also assessment team checked any change in host country criteria which may affect the baseline of the project activity.

2.5 Resolution of Findings

The objective of this phase of the verification was to resolve the requests for corrective actions and clarification and any other outstanding issues which need to be clarified for TÜV SÜD's positive conclusion on the project design and Monitoring report. 10 Clarification Requests (CLs) and 0 CARs have been raised during verification process. No Forward Action Request (FAR) was raised during this monitoring period by TÜV SÜD. All the findings were resolved during communications between the Client and TÜV SÜD. The final MR Version 02 submitted by project owners on 20-June-2023 serves as the basis for the final assessment presented. Additional changes to the project during the verification process are not considered to be significant with respect to the main VCS objectives. The Primary VCS main objectives is the reduction of anthropogenic GHG emissions and the contribution of sustainable development to the host country. Please refer Appendix 2 for the details of CARs and CLs.

2.5.1 Forward Action Requests

There were not any outstanding forward action requests raised during the verification, for the benefit of subsequent project audits.

2.6 Eligibility for Validation Activities

Not Applicable.

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

The project activity was registered under Clean Development Mechanism (CDM) of UNFCCC (Ref. number 4117) and CERs were issued from the monitoring period of 01/03/2011 to 29/02/2012 under CDM mechanism. As per MR and undertaking provided, PP would not consider the credit from any other mechanism for the current monitoring plan. The undertaking is provided to confirm that there is no any double accounting for current monitoring period. Further, Assessment team confirms that the project activity is not participating in any other form of environmental credits.

3.2 Methodology Deviations

No methodology deviation is applied during the monitoring period.

3.3 Project Description Deviations

Deviation 1:

PP has applied a deviation in length of crediting period as renewable twice due to typo error in VCS PD. In VCS PD, crediting period is mentioned as fixed for 10 years, Assessment team has check the registered CDM PDD and confirms that the crediting period was chosen as renewable. The deviation request is in line with the para 3.20 of VCS standard version 4.4. Thus, acceptable to assessment team.

3.4 Grouped Project

The project is not a grouped project thus this is not applicable.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

During the remote audit, it was concluded that the project is implemented as per the instruction of the VCS PD and this is verified from the commissioning certificate. During the current monitoring period it was observed that no unforeseen situation evolved which can impact the operation of the project activity. The same was verified through the breakdown summary sheet of the project activity. Scheduled maintenance was carried out as per the instruction of the manufacturer and the same is acceptable to the assessment team.

Project location is confirmed by the assessment team through interview with PP and monitoring report. Assessment team also checked with the photograph of project site containing latitude and longitude of the project site and confirmed that the details as mentioned in the registered PD are correct. The latitude and longitude of the project activity is given below;

Project	Song Ong hydropower project	
	Latitude	Longitude
Water intake	11° 45’ 13’’	108° 48’ 19’’
Power house	11° 44’ 56’’	108° 49’ 20’’

The technical specifications have been verified with the photographs of sites and name plates as well as with the technical specifications of hydro turbine and also cross checked from the technical manual of the Manufactures. The technical specification the project activity is given below:

Main parameters	Units	Values
1.Turbine		
• Manufacture		Chongqing Yunhe Industry (Group) Co., Ltd.
• Type		Francis, vertical axis
• Diameter of Runner	m	1.4
• Rated net head	m	27
• Number of turbine	set	03
• Turbine discharge	m3/s	11.57
• Efficiency	%	86.91
• Capacity	MW	2.7
• Annual utilisation hours	hour	5.000
2.Generator		
• Manufacturer		Chongqing Yunhe Industry (Group) Co., Ltd.
• Number	set	03
• Type		SF2700-20/3250
• Rated voltage	kV	6.3
• Rated capacity	MW	2.7
• Efficiency	%	95.2
3.Transformer		
• Manufacturer		ABB Ltd.
• Number	set	03
• Type		3 phases, 2 windings
• Rated capacity	MVA	3.5
• Primary voltage	KV	6.3
• Secondary voltage	KV	22 to 25.2 kV
4. Annual river flow	m3/s	5.81
5. Expected lifetime of the project	years	30
6. Plant load factor	%	57.08

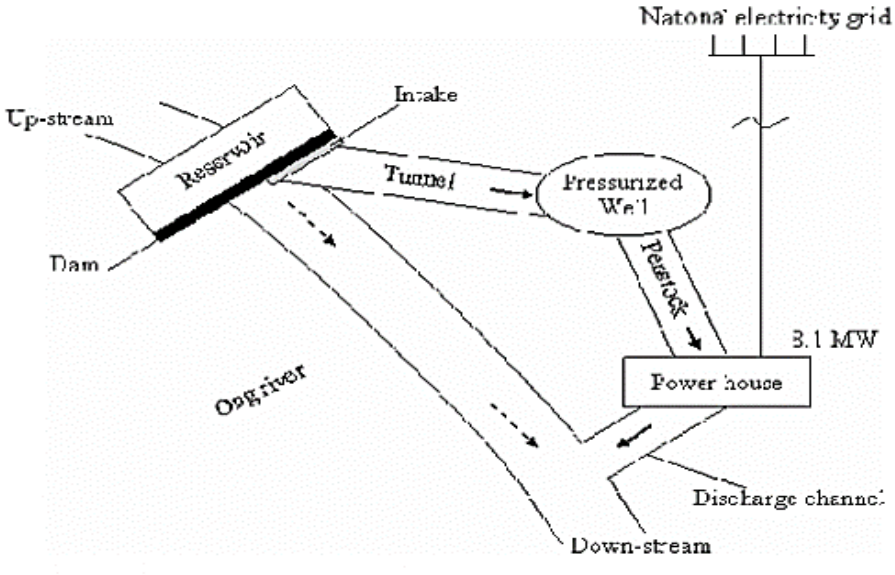

Figure 1. Song Ong Project Layout

The project is running successfully since commissioning and this project is connect to National Grid, there were several breakdowns which having slight impact on the on GHG emission reductions. Also, the breakdown having no impact on the design parameter and the project monitoring practices. The details of major breakdown have been mentioned in **Error! Reference source not found.**.

The VVB has checked that all ex-ante parameters were fixed in accordance with the VCS Standard 4.4 and the applied methodology and the registered PD. The consistency of the ex-ante values throughout the MR and ER was also checked and found to be consistent.

Assessment team checked the commissioning certificate of all units and confirms that the commissioning dates are correct.

The assessment team confirmed through interview with O & M personal on Skype that there is no changes in to the project design during this monitoring period. It was found that the monitoring plan was implemented as per the requirement of the VCS PD & approved monitoring Plan and applied methodology AMS-I.D version 16. The organisational role and responsibility as mentioned in the registered VCS PD is followed onsite. The calibration of energy meter is done as per the required frequency mentioned in the VCS PD. All the emergency preparedness as mentioned in the registered VCS PD is followed onsite and no discrepancies were found regarding the same.The information relating to the project implementation, provided in the Monitoring Report is consistent & correct. Total emission reductions achieved under this monitoring period 01/03/2018 to 23/03/2019 (including both days) is 19,369 tCO2e.

Emissions trading programs and other binding limits

Assessment team confirms that the Net GHG emission reductions or removals generated by the project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

The project has been registered under CDM programs (Ref No. 4117). Also, the Project is not rejected by other GHG programs. A declaration for the same is checked and found correct by the assessment team. Also, assessment team checked the following registries to confirm the same. The details of the registries checked are as follows:

1. http://cdm.unfccc.int/
2. http://www.goldstandard.org/

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

Conclusion:

In view of the assessment of MR and supporting documents as listed in Appendix 1 of this report, the verification team is able to confirm that the description contained in the MR of the project activity provides the reader with a clear understanding of the precise nature of the project activity and the technical aspects of its implementation. Consequently, the assessment team confirms that the project description of the project contained in the MR to be complete and accurate. The MR complies with the relevant forms and guidance for completing the VCS MR.

4.2 Safeguards

4.2.1 No Net Harm

No potential environment or socio-economic matter was found during the discussion with PP during remote audit. The project is renewable energy project and thus no negative impact observed onsite as confirmed by PP during remote audit.

SL.NO	Indicator	Assessment team opinion
1	Air quality	The project generates clean energy which replaces the fossil fuel intensive electricity generation. Also report on "Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects" prepared by MNRE dated September 2013. This report clearly mentioned that hydro plant operations do not result in direct air pollution. Adequate measures were taken to mitigate the envisaged impacts like spraying water on the road side to reduce dust level, etc. This was confirmed by the local stakeholders. Therefore, it is validated that mitigation measures were robustly implemented on ground for air quality issues project will have a positive impact on air quality
2	Soil condition	There are negligible impacts envisaged during operation of the project activity being run of river project. For mitigating the impacts during construction, various mitigation measures were taken which is validated from the plant records of PP and the interview with local villagers. It was also confirmed that, the vegetation done at site helps for soil erosion. The same is confirmed during the discussion with stakeholders during remote audit. Therefore, it can be concluded that the project has no effect on soil conditions during its operation because it has no waste coming out
3	Biodiversity	During the validation remote audit it was observed that the condition of ground vegetation will be gradually improved; No rare species has been found in the around area. The project site is not on the migration route of migratory bird. As Such large hydro plant do not have any obstruction in the path of migratory birds. Nor project is affecting aquatic life. With the implementation of Project, the greening water will be increased significantly; the biodiversity in the vicinity will be improved with the vegetation improvement. No negative impact envisaged.
4	Employment Generation	The project activity employed local population as skilled workers as well as security guards which were envisaged during the validation remote auditt. The personnel employed by the project activity are also provided trainings and exposed to various awareness programs therefore a positive indicator has been accepted.
5	Livelihood of the poor	The project is associated with infrastructure development like roads in the nearby areas and promoting economic activities like grants to local school and communities temples etc. Also, project employed local villagers as guards for the security of power project. Positive impact envisaged.

4.2.2 Local Stakeholder Consultation

LSC prior to the project implementation:

Local stakeholder consultation has been conducted during the validation stage.

As a part of continual improvement process, feedback from the associated stakeholders is vital, therefore a dedicated Visitor register cum grievance register has been placed at the project site which is accessible to stakeholders to provide their feedback on the project. It is appropriate publicly accessible location at which local stakeholders can provide their feedback on the project. This location is also conducive to continuous and regular checks for stakeholder comments. For the global stakeholders, the suggestion and the grievance can be submitted to thuydienso@yahoo.com.vnStakeholder meetings were organized at the time of registration of project activity in order to identify the major challenges around the area, stakeholders were invited well in advance through printed invitation, calls, meeting and a notice is placed around the local common areas. Various CSR activities around site are carried out. The stakeholder are also request to share their experiences and grievances on continuous basis. Registers is used to records the grievances and feedback.

During the current monitoring period, positive feedback is received regarding site operation. No grievances received during the current monitoring period, therefore, no any mitigation measures are required. In case of grievances, the nature of probable resolution is discussed with the plant head office and implemented by the site incharge. The grievance copies have been submitted to DOE.

In line with VCS requirements all the processes have been implemented to receive comments from local stakeholders as well as communicate with them at periodic intervals.

4.3 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity.

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

The verification team assessed whether the data and calculations of GHG emission reductions achieved resulting from the MR. The verification team has checked whether calculations of baseline GHG emissions, project GHG emissions and leakage GHG emissions have been carried out in accordance with the formulae and methods described in the monitoring plan of the VCS PD and MR.

Baseline Emission:- The baseline Emissions for a given year is calculated by multiplying the energy baseline (EB) with the regional grid emission factor of the grid.

Formula Used: BE_y = $EG_{BL,y} * EF_{grid,CM,y}$ Where:

BE_y Baseline emissions in year y (tCO_2e/yr)

$EG_{BL,y}$ Quantity of net electricity generation supplied by the hydropower plant to the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EF_{grid,CM,y}$ Combined margin CO2 emission factor of the national electricity grid in year y(tCO2/MWh).

Ex-ante parameters"

The grid emission factor i.e. 0.5355 tCO2/MWh is sourced from the CDM registered PDD. The same is used for calculation of emission reductions. In addition to this, other ex-ante parameters which are soured from the CDM registered PDD are provide below:

Parameters Available at Validation and Data Fixed Ex-ante:

Data/parameter	Unit	Value applied	Assessment
Cap_{BL}	MW	0	Since the project activity is a newly constructed power plant, therefore this value is considered zero. This is the fixed ex ante parameter and found to be correct by the assessment team.
A_{BL}	m^2	0	Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero: The project activity is newly constructed power plant and this value does not exist prior to implementation. Thus, value is considered zero. This is a fixed parameter and found correct.
Heat Rate	Kcal/kWh	Value applied in grid emission factor calculation	This value was directly soured from the CDM PDD which was used to calculate grid emission factor. Assessment team has crosscheck the registered PDD and found to be correct
$NCV_{i,y}$	TJ/Gg	43.3	Net calorific value (energy content) of diesel in year y. The default value is taken from IPCC 2006 Guidelines used for calculation of $PE_{EF,y.}$ Assessment team has crosscheck the registered PDD
$EF_{CO2,diesel,y}$	$kgCO_2/TJ$	74800	CO_2 emission factor of diesel in year y. this value is used for calculation of $PE_{EF,y.}$ Assessment team has crosscheck the registered PDD and found correct.

$EF_{CO2,i,y}$	tCO_2/GJ	Value applied in grid emission factor calculation	Default value sourced from the IPCC 2006 Guidelines which was used to calculate ex-ante EF_{OM} and EF_{BM}. Assessment team has check the registered PDD and found correct.
$EG_{m,y}$	MWh	The grid emission factor was directly source from the CDM PDD.	Net electricity generated and delivered to the grid by power plant/unit m in year y : This values was used for calculation of EF_{OM} and EF_{BM} ex-ante in CDM PDD. Assessment team has confirmed checking it from registered PDD.

Ex-post parameter:

As per the registered VCS PD and monitoring plan, PP has monitored following parameter needs to be monitored:

Monitoring parameters:

Means of verification

Referring to VCS v4.3 and p.360, p.361, p.363 and p.364 of CDM VVS PA, v3.0, the below tables provide a summary on the verification of each monitoring parameter listed in the registered monitoring plan.

Data / Parameter:	$EG_{y, export}$
Data unit:	MWh
Description:	Electricity supplied by the proposed hydropower plant to the national grid
Source of data used:	Direct measurement at the connection point.
Means of verification/Comments :	Value monitored is 36,198 Two-way power meters are installed at the grid-connected point to measure the amount of electricity supplied to the grid by the proposed project by the positive direction. The readings of electricity meter are hourly measured and monthly recorded. The recorded data would be confirmed by the joint balance sheet which would be signed by the representatives of EVN and the project owner. Electronic data would be archived within the crediting period and 2 years after the end of the crediting period The calibration is carried out once in two year for main meters and backup meters. The meters are calibrated according to

the relevant national standard and regulations; net electricity generation delivered to the grid are recorded by both the project owner and the grid company.

Technical Details	Main Power meter CTC	Backup Power Meter CTP	Remark
Serial number	8062733	8062734	Replaced 14/8/2018
	18055186	18055187	New installed 14/8/2018
Model	PB3KAAGHT-5		
Accuracy	0.5	0.5	
Date of current Calibration	08/04/2017	08/04/2017	For old meters
	14/08/2018	14/08/2018	For new meter
Calibration Validity	31/08/2020		
Calibration Frequency	At least once per two years		

The audit team has checked the monthly joint balance sheets for the complete monitoring period.

This value ($EG_{y, export}$) is calculated by summing all the electricity exported to the grid from each month during the monitoring period.

Cross-check	The collected data are cross checked by the audit team from the sales invoices raised by PP.

Data / Parameter:	$EG_{y, import}$
Data unit:	MWh

Description:	Electricity supplied by the national grid to the proposed hydropower plant
Source of data used:	Direct measurement at the connection point.
Means of verification/Comments:	Value monitored is 27.6 Two-way power meters are installed at the grid-connected point to measure the amount of electricity supplied to the grid by the proposed project by the positive direction. The readings of electricity meter are hourly measured and monthly recorded. The recorded data would be confirmed by the joint balance sheet which would be signed by the representatives of EVN and the project owner. Electronic data would be archived within the crediting period and 2 years after the end of the crediting period The calibration is carried out once in two year for main meters and backup meters. The meters are calibrated according to the relevant national standard and regulations; net electricity generation delivered to the grid are recorded by both the project owner and the grid company.

Technical Details	**Main Power meter CTC**	**Backup Power Meter CTP**	**Remark**
Serial number	8062733	8062734	Replaced 14/8/2018
	18055186	18055187	New installed 14/8/2018
Model	PB3KAAGHT-5		
Accuracy	0.5	0.5	
Date of current Calibration	08/04/2017	08/04/2017	For old meters
	14/08/2018	14/08/2018	For new meter

		Calibration Validity	31/08/2020	
		Calibration Frequency	At least once per two years	
		The audit team has checked the monthly joint balance sheets for the complete monitoring period. This value ($EG_{y,\ import}$) is calculated by summing all the electricity exported to the grid from each month during the monitoring period.		
	Cross-check	The collected data are cross checked by the audit team from the sales invoices raised by PP.		

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh
Description:	Net electricity supplied to the national grid by the proposed hydropower plant
Source of data used:	Calculating from $EG_{y,import}$ and $EG_{y,export}$
Means of verification/Comments:	Value monitored is 36,198 Calculating by subtracting $EG_{y,\ import}$ from $EG_{y,\ export}$. Assessment team has checked by the joint balance sheet issued by EVN and project owner to ensure the consistency for the entire monitoring period. Data would be archived within the crediting period and 2 years after the end of the crediting period. This value ($EG_{BL,y}$) is calculated by summing all the electricity generation to the grid from each month during the monitoring period. It is calculated based on the following equation:- Net Energy Generation = Total energy export to the Grid – Total energy import from the grid
Cross-check	The collected data are cross checked by the audit team from the sales invoices raised by PP.

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity.
Source of data used:	Project Site
Means of verification/Comments:	Value monitored 8,100,000 Monitoring data from the nameplate of hydroelectric generating set has been verified.
Cross-check	The nameplate of hydroelectric generating set has been verified by the assessment team,

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data used:	Calculated based on the design schematics and area maps.
Means of verification/Comments:	Value monitored 17,448
Cross-check	Calculation for the area reservoir

Data / Parameter:	$FCi_{j\,y}$
Data unit:	m^2
Description:	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Source of data used:	Calculated based on the design schematics and area maps.

	Means of verification/Comments :	Value monitored 113.66 It is calculated either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift). Assessment team has cross check the purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.	
	Cross-check	Calculation for the area reservoir	
Conclusion	The monitoring has been carried out in accordance with the monitoring plan contained in the registered PDD. All parameters were monitored and determined as per the registered monitoring plan. VVB confirms through video call and telephonic interviews and from the document review, the actual monitoring system complies with the registered monitoring plan. The substantiation of this conformity on information flow for these parameters including the values in the monitoring reports is reported in the above section. During the verification, all relevant monitoring parameters of the registered monitoring plan have been verified with regard to the appropriateness of the verification method, the correctness of the values applied for ER calculation, the accuracy and applied QA/QC measures. After appropriate corrections, carried out by the project participant, it is confirmed that all monitoring parameters have been measured / determined without material misstatements and are in line with all applicable standards and relevant requirements. All parameters required to be monitored are recorded at the intervals required by the registered monitoring plan and the applied methodology. On the basis of review of source and nature of available evidences and records, the verification team confirms the quality of evidence for emission reduction provided is sufficient as per CDM VVS PA, v3.0.		

Project Emission: According to the AMS.ID and registered VCS PD, the project emission for the Hydropower project includes emission from a new reservoir and backup power. The following formula is applied: $PEy = PE_{FF,y} + PE_{HP,y}$

Where, $PE_{FF,y}$ - backup power emissions $PE_{HP,y}$ - the emissions from the reservoir

The emissions from the reservoir ($PE_{HP,y}$)

For hydropower project activity that results in new reservoirs and/or the increase of existing reservoirs, the power density (PD) of the project activity shall be calculated as follows:

$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$:

Where

PD Power density of the project activity, in W/m²

Cap_{PJ} Installed capacity of the hydro power plant after the implementation of the project activity (W).

Cap_{BL} Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero.

A_{PJ} Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²).

A_{BL} Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m²). For new reservoirs, this value is zero

If the PD is greater than 4 W/m² and less than or equal to 10 W/m²:

$$PE_{HP,Y} = \frac{EF_{Res} * TEG_y}{1000}$$

Where:

$PE_{HP,y}$ Emission from reservoir expressed as tCO_2e/year

EF_{Res} the default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO2e /MWh.

TEG_y Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh).

If PD is greater than 10 W/m2, then:

$PE_{HP,y} = 0$

Emission from diesel backup generators ($PE_{FF,y}$)

The project would employ a diesel motor as backup power for emergency situation, such as both cut-off of electricity supply and the hydropower station. According to the "Tool to calculate project or leakageCO2 emissions from fossil fuel consumption", the annual CO2 emissions from diesel oil combustion are calculated as follows:

$$PE_{FF,j,y} = \sum_i FC_{i,j,y} * COEF_{i,y}$$

And

$$COEF_{i,y} = NCV_{i,y} * EF_{CO2,i,y}$$

Where:

$PE_{FF,j,y}$ The CO_2 emissions from fossil fuel combustion in process j during the year y

$FC_{i,j\,y}$ The quantity of fuel type I combusted in process j during the year y (mass or volume unit/year)

$COEF_{i,y}$ The CO_2 emission coefficient of fuel type I in year y (tCO_2/mass or volume unit)

$NCV_{i,y}$ The weighted average net calorific value of the fuel type I in year y

$EF_{CO2,i,y}$ The weighted average CO_2 emission factor of fuel type I in year y (tCO_2/GJ)

i The fuel types combusted in process j during the year y

According to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, the NCV of diesel oil is 43.3 TJ/Gg and the emission factor is 74,800 $kgCO_2/TJ$, and thus the $COEF_{i,y}$ = 0.0032 tCO_2/kg diesel.

Therefore

$$PE_{FF,j,y} = \sum_i FC_{i,j,y} * COEF_{i,y}$$

$$PE_{FF,j,y} = 306.01 * \frac{1}{1165} * 1000 * 0.0032$$

$PE_{FF,j,y} =$ 2 tCO_2e (Roundup for each vintage year

The emission reductions (ERy) by the Project activity during a given year y is the difference between baseline emissions (BEy), project activity emissions (PEy) and leakage, as follows:

ERy = BEy – PEy – Ly

VVB confirmed that GHG reductions and removals has been quantified correctly and in line with monitoring procedure in VCS PS and applied methodology.

Therefore,

BE_y = 36,170 * 0.5355

BE_y = 19,369 tCO_2e (Round down for each vintage year)

ERy = BEy – PEy – Ly =19,369 tCO_2e - 2 tCO_2e -0

= 19,366 tCO_2e

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

Means of verification	No lack of evidence and missing data were detected during this monitoring period. All values as per the monitoring plan were crosschecked by the verification team against basic monitored data and the calculations were found to be correct. The verification team confirms that all assumptions, emission factors and default values have been correctly justified. All the emission factors, application of maximum permissible errors and default values are explicitly mentioned in the monitoring report. Hence the VVB confirms that the methods and formulae used to obtain the emissions are appropriate. No reporting risks have been identified for the data reported. Troubleshooting procedure, maintenance, and calibration of monitoring equipment, monitoring measurements and reporting, record handling and maintenance, reviewing monitored data are available at the plant. All the monitored data are archived partially in electronic and paper form. The data will be kept for the whole crediting period and 2 years after the last crediting period thereby meeting the requirement of the monitoring plan.
Conclusion	The formulae and the methods referred in the MR and the emission reduction calculation spread sheet comply with the methods described in the registered PD.

	No lack of evidence and missing data were detected during this monitoring period. All values as per the monitoring plan were crosschecked by the verification team against basic monitored data and the GHG emission calculation is found correct. TUV SUD confirms that all assumptions, emission factors and default values have been correctly justified. All the emission factors and default values are explicitly mentioned in the monitoring report. Calculations applied formulae and method for calculation of GHG emission are in accordance with the registered monitoring plan and are in line with the requirements of VCS, the applied methodology.

4.6 Non-Permanence Risk Analysis

Not applicable.

5 VERIFICATION OPINION

TÜV SÜD South Asia Private Limited has performed verification of the emission reductions reported for the project activity Song Ong Hydropower Project in Vietnam VCS Registration Reference No. 836, for the period 01-March-2018 to 23-March-2019 (Inclusive of both days), with regard to the relevant requirements for VCS Version 4.4.

The project proponent is Song Ong Hydropower Joint Stock Company who is responsible for:

1. 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 PD, version 02 dated 20-June-2023;
2. 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.

Based on the documented evidence and corroborated by an on-site assessment, TÜV SUD can confirm that:

1. The project has been implemented and operated as per the validated PD;
2. The monitoring plan in the registered PD is as per the applied baseline and monitoring methodology;
3. The monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable VCS requirements and
4. Level of assurance on the quantity of GHG emission removal in tCO_2 equivalents achieved by the project during the verification period as provided in the project's GHG statement is reasonable.

The GHG emission reductions were calculated correctly on the basis of the approved monitoring methodology AMS-I.D Ver 16 and the monitoring plan in the validated PD. Hence it is certified that the GHG removals by sink from the project during the monitoring period amount as follows:

Verification period: From 01-March-2018 to 23-March-2019

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)

01-March-2018 to 31-December-2018	14,769	1	0	14,768
01-January-2019 to 23-March-2019	4,599	1	0	4,598
Total	19,368	2	0	19,366

Year	*Ex-ante emissions reductions /removals*	***Achieved emissions reductions /removals***	***Percent difference***	***Justification for the difference***
01-March-2018 to 23-March-2019	22,765	19,366	-14,92%	VVB concludes that This is due to climatic conditions and low PLF attained by the plant during the current monitoring period
Total	22,765	19,366	-14,92%	VVB concludes that This is due to climatic conditions and low PLF attained by the plant during the current monitoring period

For the total Monitoring period 01-March-2018 to 23-March-2019, 19,366tCO_2e equivalent of credits eligible for issuance as VCUs.

APPENDIX 1: DOCUMENTS REVIEWED

No.	Author	Title	References to the document
1	UNFCCC	AMS-I.D ver 16 :- Grid connected renewable electricity generation.	From UNFCCC Website
2	PP	VCS Project Description Dated:28/12/2012	
3	Verra	VCS Standard v 4.4 VCS verification report template Version-4.2	From Verra Website
4	PP	VCS MR – template Version 4.1 version 2	-
5	PP	ER Calculation sheet Version 2.0	-
6	PP	Commissioning Certificates for hydro power plant	-
7	PP	Calibration test certificates	-
8	PP	Monthly Energy generation details Diesel Consumption details	-
9	PP	Invoices & Joint Balance Sheets	-
10	PP	Power Purchase agreement for the project activity	-

11	Google Earth	GPS coordinates for Hydro power plant	-
12	PP	Emission Factor of VN grid	-
13	PP	Grievance Register	-
14	PP	Single Line Diagram	-
15	PP	Site photographs & Videos of Hydro plant and energy meters	-
16	PP	List of staff & Training records	-
17	PP	Technical Equipment List	-
18	PP	Equipment Contract	-
19	PP	Breakdown Details	

APPENDIX 2: CLARIFICATION REQUESTS, CORRECTIVE ACTION REQUESTS AND FORWARD ACTION REQUESTS

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

NA

Table 2. CL from this verification

CL ID	01	**Section no.**	3.1 & 4.2 of MR	**Date:** 31/03/2023
Description of CL				
PP need to provide below listed supporting document: 1. Commissioning certificates. 2. Calibration Certificates for meters for year 2018 & 2019				
Project participant response				**Date:** 17/04/2023
PP has provided the Commissioning certificate and Calibration Certificates for year 2018 and 2019				
Documentation provided by project participant				

Commissioning certificate Calibration Certificates	
DOE assessment	**Date:** 08/05/2023
PP needs to provide the documents in translated version (English)	
Project participant response (Round 2)	**Date:** 20/06/2023
PP has provided the translated documents and calibration certificates in translated version.	
Documentation provided by project participant	
Commissioning certificate (provided the translation document) Calibration Certificates (the certificates are translated)	
DOE assessment	**Date:** 26/06/2023
PP has given the required documents. It is found correct; hence **CL 01 is closed.**	

CL ID	02	**Section no.**	NA	**Date:** 31/03/2023
Description of CL				
PP is requested to give clarification for emission reduction calculations for project electricity system for grid power plants.				
Project participant response				**Date:** 17/04/2023
JMRs indicate the electricity export to grid and the electricity import to consume from the grid. So based on that, PP has calculated the net electricity export to the grid and baseline emission.				
Documentation provided by project participant				
JMRs				
DOE assessment				**Date:** 08/05/2023
PP has given the clarification on electricity export and baseline emission. It is found correct; hence **CL 02 is closed.**				

CL ID	03	**Section no.**	4.2 of MR	**Date:** 31/03/2023
Description of CL				
To verify the electricity imports of the facility, PP provided the Excel copies of the meter readings which will be considered as potent source hence, PP needs to provide the copy of original Invoices of the metering.				
Project participant response				**Date:** 17/04/2023
PP has provided the invoices of electricity import.				
Documentation provided by project participant				
Invoices				
DOE assessment				**Date:** 08/05/2023
PP needs to provide the relevant invoices in translated version (English).				
Project participant response (Round 2)				**Date:** 20/6/2023
PP has provided the invoices in translated language from Vietnamese to English.				

Documentation provided by project participant	
Invoices (provided the translated version of Invoices)	
DOE assessment	**Date:** 26/06/2023
PP has given the required documents. It is found correct; hence **CL 03 is closed.**	

CL ID	04	**Section no.**	2.1 of MR	**Date:** 20/04/2023
Description of CL				
PP needs to provide latest or previous EIA reports done at the time of validation and if any negative impacts mentioned in it.				
Project participant response				**Date:** 08/05/2023
The EIA report and approval from the local authority are provided. No negative impacts mentioned in it.				
Documentation provided by project participant				
EIA report EIA approval by local authority.				
DOE assessment				**Date:** 26/06/2023
PP has provided the relevant documents. It is found correct; hence **CL 04 is closed.**				

CL ID	05	**Section no.**	4.1 of MR	**Date:** 20/04/2023
Description of CL				
Provide EVN report and how it is determined. As per the methodology requirements what value has been considered. Also, how the parameter heat rate is playing a part emission reduction calculation for grid emission factor.				
Project participant response				**Date:** 08/05/2023
The official reports of Emission Factor by Department of Climate Change of are provided				
Documentation provided by project participant				
Official reports of Vietnam Emission Factor				
DOE assessment				**Date:** 26/06/2023
PP has provided the relevant EVN reports & documents. It is found correct; hence **CL 05 is closed.**				

CL ID	06	**Section no.**	3.1 of MR	**Date:** 20/04/2023
Description of CL				
PP needs to provide information in translated version & also pictures of 3 nos turbines, Main meter readings, Check meter readings, sub-stations, transformers, generators, daily logbook, & control management system data present on site which weren't clearly visible at the time of remote audit.				
Project participant response				**Date:** 08/05/2023
The documents and picture are provided				
Documentation provided by project participant				

Daily logbook from March 2018 to March 2019 provided. Pictures of 3 nos turbines, Main meter readings, Check meter readings, sub-stations, transformers, generators, and control management system data provided
DOE assessment **Date:** 26/06/2023
PP has provided the daily logbook, photos of meters & relevant documents. It is found correct; hence **CL 06 is closed.**

CL ID	07	**Section no.**	1.1 of MR	**Date:** 20/04/2023
Description of CL				
PP has not provided supporting documents for information provided in section 1.11 In section 1.11 "Table 1: Sustainable Development Contributions" contains non-informative details hence PP need provide the revised information in respective section of Monitoring Report.				
Project participant response				**Date:** 17/04/2023
The supporting documents has provided.				
Documentation provided by project participant				
The operation report provided				
DOE assessment				**Date:** 08/05/2023
PP needs to provide the relevant documents in translated version (English).				
Project participant response (Round 2)				**Date:** 20/6/2023
PP has provided the documents in translated language from Vietnamese to English.				
Documentation provided by project participant				
The operation report (provided the translated version of Invoices)				
DOE assessment				**Date:** 26/06/2023
PP has given the required documents. It is found correct; hence **CL 07 is closed.**				

CL ID	08	**Section no.**	3.2 of MR	**Date:** 20/04/2023
Description of CL				
PP needs to provide the translated version (in English) of PPI for EVN.				
Project participant response				**Date:** 08/05/2023
The Power Purchase Agreement provided				
Documentation provided by project participant				
PPA updated				
DOE assessment				**Date:** 26/06/2023
PP has given the required documents. It is found correct; hence **CL 08 is closed.**				

CL ID	09	**Section no.**	3.1 of MR	**Date:** 20/04/2023
Description of CL				

PP needs to submit the Purchase contracts in English language for the given list of equipments.	
Project participant response	**Date:** 08/05/2023
The equipment purchase contract provided	
Documentation provided by project participant	
Equipment contract updated	
DOE assessment	**Date:** 26/06/2023
PP has given the required documents. It is found correct; hence **CL 09 is closed.**	

CL ID	10	**Section no.**	4.3 of MR	**Date:** 20/04/2023
Description of CL				
PP needs to submit the documents for employees working on-site with their roles, designation, Training records & educational background.				
Project participant response				**Date:** 08/05/2023
the list for employees with their roles, designation, Training records & educational background provided				
Documentation provided by project participant				
List of employees Training Certificates				
DOE assessment				**Date:** 26/06/2023
PP has given the supporting documents of trainings conducted for employees. It is found correct; hence **CL 10 is closed.**				

Table 3. CAR from this verification

NA

Table 4. FAR from this verification

NA