



KISHANGANGA HYDROELECTRIC PROJECT



Document Prepared By

LGAI Technological Center S.A. (Applus+ Certification)

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Summary:

Verification purpose: LGAI Technological Center S.A. (Applus+ Certification) (Hereafter referred as Applus+ Certification) has been appointed^{/2/} by “NHPC Limited” to perform the 3rd verification (01-April-2021 to 30-June-2022) of the “Kishanganga Hydroelectric Project” (VCS ID 1891)^{1/4/}. The main purpose of this verification activity is to have an independent third party for the assessment of the project design, monitoring report to ensure a thorough assessment of the proposed project activity against the applicable VCS requirements.

The purpose of the project activities to generate energy electricity by the utilization of Hydroelectric energy and further selling the generated energy to the Indian grid. The power (electricity) thus produced by the project activity would be transmitted to Indian electricity grid. Therefore, the project activity is displacing an equivalent amount of electricity which would have been otherwise generated in fossil fuel dominant electricity grid. The project activity is installation and operation of a 330 MW capacity run-of-the-river hydro power project located in Bandipora District of Jammu & Kashmir state of India. The Project Activity was commissioned in three phases, first turbine was commissioned on 13-March-2018, second on 21-March-2018 and last one on 30-March-2018.^{/01/}. The monitoring period for this VCS verification is 01-April-2021 to 30-June-2022 (including both days) and the project activity achieved 1,986,885 tCO₂e emission reductions during this monitoring period thereon displaced 2,177,170 MWh amount of electricity from the generation-mix of power plants connected to the Indian Grid, which is mainly dominated by thermal/fossil fuel-based power plant.

The scope of the verification is the independent and objective review of the Monitoring Report (MR)^{/5/}. The MR is reviewed against the relevant criteria (see above) and decisions by the CDM Executive Board and VCS executive board, including the approved baseline and monitoring methodology. The verification was based on the guidance given in the CDM validation and verification standard for project activities, version 03.0^{/13/}, review against registered VCS PD^{/4/} and final validation report, CDM validation and verification standard for project activities, version 03.0^{/13/}, VCS program guide version 4.3^{/8/} and VCS Standard Version 4.4^{/8/}.

A risk-based approach has been followed to perform this verification activity. In the course of verification, 06 Corrective Action requests (CAR), 00 Clarification Requests (CLs) were raised and successfully closed. No FAR was raised during this verification. The review of the Monitoring report and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and PP have provided LGAI Technological Center S.A. (Applus+ Certification) with sufficient evidence to verify the fulfilment of the stated criteria of VCS.

The assessment team has employed a risk-based approach to assess the completeness and accuracy of the claims and conservativeness of the assumptions in the MR. The main focus of the assessment team is to identify the significant risks for the project implementation and the generation of VCU. The verification is not meant to

¹ <https://registry.terra.org/app/projectDetail/VCS/1891>

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 combined.

The only purpose of the verification is its usage during the issuance process as part of the VCS project cycle. Therefore, LGAI Technological Center S.A. (Applus+ Certification) can't be held liable by any party for decisions made or not made based on the verification opinion, which will go beyond that purpose.

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 document verifications. The entire documents checked/verification conducted to arrive at positive verification conclusions.

CONTENTS

1. Introduction	6
1.1 Objective	6
1.2 Scope and Criteria	6
1.3 Level of Assurance.....	7
1.4 Summary Description of the Project	7
2. Verification Process	7
2.1 Method and Criteria.....	7
2.2 Document Review	10
2.3 Interviews	10
2.4 Site Visits.....	11
2.5 Resolution of Findings	11
2.5.1 Forward Action Requests.....	12
2.6 Eligibility for Validation Activities	12
3. Validation Findings	12
3.1 Participation under Other GHG Programs	12
3.2 Methodology Deviations.....	12
3.3 Project Description Deviations.....	13
3.4 Grouped Project	13
4. Verification Findings	13
4.1 Project Implementation Status	13
4.2 Safeguards	20
4.2.1 No Net Harm	20
4.2.2 Local Stakeholder Consultation	22
4.3 AFOLU-Specific Safeguards	23
4.4 Accuracy of GHG Emission Reduction and Removal Calculations	23
4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals	25
4.6 Non-Permanence Risk Analysis.....	26
5. Verification Opinion.....	27
APPENDIX 1: Documents Reviewed or Referenced	29

APPENDIX 2: CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS (CAR/CL/FAR)	31
APPENDIX 3: COMPETENCE OF TEAM MEMBERS AND TECHNICAL REVIEWERS.....	35
APPENDIX 4: ABBREVIATIONS	37
APPENDIX 5: Calibration details	38

1. INTRODUCTION

1.1 Objective

LGA Technological Center S.A. (Applus+ Certification) (Hereafter referred as Applus+ Certification) has been appointed by “NHPC Limited” to perform the 3rd verification of the “Kishanganga Hydroelectric Project” under VCS Project guide, version 4.3 and VCS standard, 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. In particular;

- The project's baseline is assessed against ACM0002, version 19.0/^{15/}
- The project's monitoring plan is assessed against “ACM0002, version 19.0/^{15/}
- the projects compliance with the requirements of Article 12 of the Kyoto Protocol, the CDM Modalities and Procedures as agreed in the Marrakech Accords under decision 3/CMP.1, the annexes to this decision, subsequent decisions and guidance made by COP/MOP & CDM Executive Board and other relevant rules, including the Host Country legislation and sustainability criteria along with VCS program guide, version 4.3 and VCS standard, version 4.4
- CDM validation and verification standard for project activities, version 03.0/^{13/}
- VCS program guide version 4.3/^{8/}
- VCS standard version 4.4/^{8/}

Verification is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of verified carbon units.

1.2 Scope and Criteria

The scope is defined as an independent and objective review of the Monitoring report (MR)^{/5/} prepared as per the registered VCS PD &MR/^{4/} and registered approved methodology ACM0002, version 19/^{15/}. The MR is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board and VCS standard, version 4.4 and programme guide, version 4.3, including the approved baseline and monitoring methodology ACM0002, version 19. The verification was based on the requirements in the CDM validation and verification standard for project activities, Version 03.0 and VCS program guide version 4.3 and VCS Standard Version 4.4.

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 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. Verification team conducted onsite audit to verify metering/monitoring arrangement. The verification team has reviewed all the documents like commissioning certificates^{/1/}, technical specification^{/16/}, Deviation Settlement Account statement issued by NRPC^{2/7/}, JMR as per Monthly Generation Report^{/9/}, invoices^{/9/}, grievance register^{/12/} etc.

1.3 Level of Assurance

Applus + Certification has planned and performed the verification by obtaining evidence and other information and explanations that assessment team considers necessary to give reasonable assurance that reported estimated GHG emission reductions are fairly stated. All documentary evidences were checked, a site audit was conducted to verify metering/monitoring arrangement to arrive at a verification conclusion by the assessment team.

In our opinion, the estimated GHG emissions reductions were calculated correctly on the basis of the approved baseline and monitoring methodology ACM0002, version 19.0 and the VCS Standard Version 4.4.

1.4 Summary Description of the Project

The project activity is a hydro power generation project. The project activity involves installation of 330 MW capacity run-of-the-river hydro power project located in Bandipora District of Jammu & Kashmir state of India. The Project activity is promoted by NHPC Limited. The monitoring period this VCS verification covered from 01-April-2021 to 30-June-2022 (inclusive of both dates) and the project activity achieved 1,986,885 tCO₂e emission reductions during this monitoring period. The start date of the Project Activity is 13-March-2018, which is the date of commissioning of the first turbine. The Project Activity was commissioned in three phases, first turbine was commissioned on 13-March-2018, second on 21-March-2018 and last one on 30-March-2018. Assessment team checked the commissioning status of the project activity with the commissioning Certificates and during on-site visit and found correct. The project is implemented as per the description in the registered VCS PD & MR^{/4/}. No event observed during the current monitoring period which can alter or deviate from the methodology requirement.

2. VERIFICATION PROCESS

2.1 Method and Criteria

Verification Process: The project assessment is based on the “CDM validation and verification standard for project activities, Version 03.0, VCS standard, version 4.4, VCS program guide

²Northern Regional Power Committee

version 4.3 and is conducted using standard auditing techniques to assess the correctness of the information provided by the project participants. Before the assessment begins, members of the team covering the technical scope(s), sectoral scope(s), and relevant host country experience for evaluating the VCS project activity are appointed.

Once the project is received by the assessment team, the members of the assessment team carried out: -

1. A desk review of the Monitoring report against the registered VCS PD&MR /04/ and final validation report;
2. Site Visit;
3. The resolution of outstanding issues and the issuance of the final verification report and opinion.

The prepared verification report and other supporting documents then undergo an internal quality control at the HQ (Accredited office) before being submitted to the VCS executive board.

In order to ensure transparency, assumptions must be clear and stated explicitly and background material must also be referenced. Applus+ Certification has developed a specific checklist customized for the project. The checklist demonstrates, in a transparent manner, the project criteria (requirements), discussion on each criterion by the assessment team, and the results from validating the identified criteria.

Appointment of the assessment team

According to the sectoral scope / technical area and experience in the sectoral or national business environment, Applus+ Certification has composed a project assessment team in accordance with the appointment rules in the internal Quality Management System of Applus+Certification.

The composition of audit team shall be approved by the Applus+ Certification ensuring that the required skills are covered by the team.

The four qualification levels for team members that are assigned by formal appointment rules are as presented below:

- Lead Auditor (LA).
- Auditor (A) / Auditor in Training (AiT).
- Technical Expert (TE).
- Technical Reviewer (TR).

The sectoral scope / technical area knowledge linked to the applied methodology/ies shall be covered by the assessment team.

Name	Role	SS Coverage	TA Coverage	Financial aspect	Host country experience
Mr. Pankaj Kumar	LA/TE	YES	YES	NA	YES
Mr. Deepak Pundlik	A	YES	YES	NA	YES

Name	Role	SS Coverage	TA Coverage	Financial aspect	Host country experience
Mr. Simon Shen	TR	YES	YES	NA	YES

The detail regarding the assessment team is provided below in this report as Appendix 3.

Document review

The Monitoring report version 01/05/ submitted by the PP was reviewed against the approved methodology/^{15/}, approved registered VCS PD&MR/^{04/}, final validation report and other relevant criteria to verify the correctness, credibility, and interpretation of the presented information.

Further, a cross-check between information provided and information from other sources has been done. A complete list of all documents and evidence material reviewed is included in this report below in Appendix 1.

Site Visit

An Onsite Inspection is conducted by Applus+ Certification. Audit team performed physical interview with project stakeholders to confirm selected information and to resolve issues identified in the document review. The detail is provided in this report.

Resolution of Clarification and Corrective Action Request

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 Applus+ Certification positive conclusion on the Monitoring report. The Corrective Action Requests and Clarification Requests raised by Applus+ Certification were resolved during communications between the Client and Applus+ Certification to guarantee the transparency of the verification process, the concerns raised and responses given are summarized below in the Appendix 2.

The final MR Version 04/05/ submitted by PP, 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 CDM/VCS objectives. The two CDM/VCS main objectives are the reduction of anthropogenic GHG emissions and the contribution of sustainable development to the host country.

Internal quality control

As final step of a verification of the final documentation including the verification report and the checklist have to undergo an internal quality control by the technical review committee, i.e., each report has to be finally approved either by the head of the technical review committee or the deputy. In case one of these two persons is part of the assessment team approval can only be given by the other one to avoid any conflict of Interest.

After confirmation of the PP the positive verification opinion and relevant documents are submitted to the VCS board through the VCS web-platform.

2.2 Document Review

The details of the document observed during the verification process are listed below in Appendix 1 of this report

2.3 Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Prakash	Mr. Om	Site-Incharge	09-March-2023	Project Implementation, JMR & invoicing procedure, calibration, grievance mechanism, Management practices, data storage, QA/QC	Mr. Pankaj Kumar
2.	Kumar	Mr. Sanjay	Senior Manager			
3.	Kumar	Dheeraj	Villager			
4.	Kapil	Mr. Krishan	MPCON Ltd		GHG calculations, MR and ER preparation, Data collection, data storage, QA/QC	

2.4 Site Visits

Duration of on-site inspection: 09-March-2023				
No.	Activity performed on-site	Site location	Date	Team member
1.	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.	Bandipora District of Jammu & Kashmir state of India.	09-March-2023	Mr. Pankaj Kumar

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 from verification which need to be clarified for Applus+ Certification's positive conclusion on the Monitoring report. The Corrective Action Requests and Clarification Requests raised by Applus+ Certification were resolved during communications between the Client and Applus+ Certification to guarantee the transparency of the verification process, the concerns raised and responses given are summarized below in the Appendix 2.

The final MR Version 04/05/ submitted by PP 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 CDM/VCS objectives. The two CDM/VCS main objectives are the reduction of anthropogenic GHG emissions and the contribution of sustainable development to the host country.

Areas of validation and verification findings	No. of CL	No. of CAR	No. of FAR
Project design document and Monitoring report	00	01	00
Description of project activity	00	02	00
Application of selected baseline and monitoring methodology and selected standardized baseline			
Applicability of methodology and standardized baseline	00	00	00
Deviation from methodology	00	00	00
Clarification on applicability of methodology, tool and/or standardized baseline	00	00	00
Project boundary	00	00	00
Establishment and description of baseline scenario	00	00	00

Areas of validation and verification findings	No. of CL	No. of CAR	No. of FAR
Demonstration of additionality	00	00	00
Emission reductions	00	01	00
Calibration details	00	01	00
Monitoring plan	00	00	00
No Net harm assessment	00	00	00
Local stakeholder consultation	00	01	00
Others (please specify)	00	00	00
Total	00	06	00

The list of findings and the resolution is presented in Appendix 2 of this report.

2.5.1 Forward Action Requests

This is 3rd verification of the project activity and no FAR was raised from Validation or previous Verification.

2.6 Eligibility for Validation Activities

This section is not applicable for present verification, as Applus+ Certification holds the accreditation for Validation of projects under this Sectoral Scope.

3. VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

The project is not applied under any other GHG program like CDM, GS. hence not applicable. Assessment team verified the same with other GHG mechanism's project interface. Moreover, PP has also submitted an officially attested declaration letter ^{/10/}to assessment team regarding no participation in other GHG program for the concerned monitoring period. Found acceptable.

3.2 Methodology Deviations

This section is not applicable for present verification as no methodology deviation sought during this verification and also in the earlier verifications by project participant. Further no deviation obtains by PP during previous verification too.

3.3 Project Description Deviations

Project description deviations applied during current monitoring period

Deviation 1:

During current monitoring period (01-April-2021 to 30-June-2022), There is a change in other entity as per registered VCS PD. The details for other entity involved for the current monitoring period is mentioned below-

Organization name	MPCON Ltd
Role in the Project	Project consultant
Contact person	Mr Manoj Mishra
Title	Chief Manager
Address	Ground Floor, Rajiv Gandhi Bhawan-2, 35, Shyamla Hills, Bhopal -462002
Telephone	0755-4909829,2666556
Email	operationscc.mpcon@mpconsultancy.org

The applied deviation doesn't have any impact on the project applicability, baseline scenario, additionality etc. Hence, accepted.

3.4 Grouped Project

This is not applicable, as the project is not a grouped project

4. VERIFICATION FINDINGS

4.1 Project Implementation Status

During the Onsite Inspection with PP representatives & plants in-charge and subsequent document verification; commissioning certificates, PPA, Deviation Settlement Account statement issued by NRPC, JMR as per Monthly Generation Report and invoices, it was concluded that the project is implemented as per the requirement of the registered VCS PD&MR and approved monitoring plan. During the current monitoring period, it was observed that no unforeseen incident/event evolved which can impact the operation of the project activity which was verified from breakdown records. The project undergone continuous operation and only scheduled maintenance is observed as per the manufacturer's specification which is acceptable to the assessment team and evident from Deviation Settlement Account statement issued by NRPC /JMR as per Monthly Generation Report. The project activity entails installations of turbines

having a total capacity of 330 MW capacity run-of-the-river hydro power project installed in this project activity.

Project is already commissioned & fully operational. The details of commissioning are as follows:

Project Name	Unit No.	Turbine Capacity	Location	Commissioning Date ³
Kishanganga Hydroelectric Project	I	110 MW	Bandipora; Jammu & Kashmir	13-Mar-2018
	II	110 MW	Bandipora; Jammu & Kashmir	21-Mar-2018
	III	110 MW	Bandipora; Jammu & Kashmir	30-Mar-2018

The Project Activity was commissioned in three phases, first turbine was commissioned on 13-March-2018, second on 21-March-2018 and last one on 30-March-2018. Assessment team checked the commissioning certificate/^{1/} and confirmed that the dates of Commissioning for the turbines are correct. Assessment team also confirm during interview with the PPs representatives that there is no change in project design and the project is implemented as per the description provided in the VCS PD&MR. The details of turbines are provided below:

Assessment team also checked the technical details of the turbines installed onsite from documents submitted by PP and previous verification reports. The same is cross checked from the photographs of the name plates, module capacity etc. submitted by PP & also cross checked from the technical details from Manufacturer.

Technical details is given below:

³<https://cea.nic.in/wp-content/uploads/2020/04/qly98.pdf>

KISHANGANGA H. E. PROJECT (3 x 110 MW), J&K

SALIENT FEATURES

1	LOCATION	
	State	Jammu & Kashmir
	District	Bandipora
	River	Kishanganga
	Dam site	Gurez valley
	Latitude	34°39'00"
	Longitude	74°45'08"
	Power House site	Near village Kralpora, Bandipora
	Latitude	34°28'17"
	Longitude	74°38'28"
2	HYDROLOGY	
	Catchment area	1815 km ²
	Max. Observed flood	990 cumec
	Probable Max. flood	2000 cumec
	Avg. Annual run-off	3103 Mcum
	Annual rainfall	676 mm
	Annual snowfall	1206 mm
3	RESERVOIR	
	Full Reservoir level	2390.0m
	Max. Reservoir level	2390.0m
	MDDL	2384.5m
	Gross storage upto FRL	18.35Mcum
	Dead storage capacity	10.80Mcum
	Live storage capacity	7.55 Mcum
4	DAM	

	Type	CFRD
	Max. height above deepest river bed	37m
	EL. of Top of dam	2395.0m
5	SPILLWAY	
	Design flood	2000 cumec
	Type	Chute Spillway
	Crest elevation of gated spillway	2370.00m
	No. of gates	3
	Energy dissipation	Flip bucket
6	DIVERSION TUNNEL	
	Number	1
	Size	9.5m dia
	Shape	Horse shoe
	Length	569m
	Diversion capacity	1000 cumecs
7	INTAKE	
	Invert level	El 2378.80
8	HEAD RACE TUNNEL	
	Number	1
	Size and Shape	6.24m Horse Shoe Shape (DBM) /5.2 m dia., Circular (TBM)
	Length	23.2 km (14.75km TBM & 8.45km DBM) Approx.
	Design discharge	58.40 cumec
9	HRT ADITS	
	No. & Length	Three – 224m, 659m & 262m
10	SURGE SHAFT	
	Dia.	17.75 m

	Height	109.66m
	Type	Restricted orifice
11	PRESSURE SHAFT	
	No. & type	One circular, Inclined, steel lined
	Diameter	4.0m, trifurcating into three 2.30m dia., horizontal branches at bottom
	Length	1020m
12	POWER HOUSE COMPLEX	
	Type	Underground, two caverns
	Installed capacity	330 MW
	No. of units	3
	Power house cavity	113m x 21.3m x 46.5m
	Transformer hall cavity	75m x 15m x 15.2m
	Type of turbine	Pelton wheel
	Design Max. Gross head	670.82m
	Rated net head	646m
	Tail water level	
	For 1 unit operation	1711.18m
	For 2 unit operation	-
	For 3 unit operation	1714.15m
13	TAIL RACE SYSTEM	
	Tunnel Portion	
	Tunnel Portion type	Horse shoe
	Length	903m Approx.
	Diameter	5.0m

	Open channel	Length 36m Approx.
14	SWITCHYARD	
	Size & Location	191m x 115m Near Kralpora village
15	POWER GENERATION	
	Installed capacity	330 MW
	Annual design energy generation	1712.96Gwh

The assessment team confirmed that there is no proposed or actual change to the project design during this monitoring period. The project design as mentioned in the registered VCS PD& MR is implemented and thus the same is acceptable to the assessment team. All required monitoring equipment's and procedures as mentioned in the registered VCS PD&MR are available and implemented in an appropriate manner.

Geo-coordinates of the project location are:

Dam site	Latitude- 34 ° 39' 00" N, Longitude- 74 ° 45' 08" E
Power Station site:	Latitude- 34 ° 28' 17" N, Longitude- 74 ° 38' 28"E

Geo coordinates were checked on the google earth and also cross-checked with validation report and verification team concluded that the geo coordinates of project locations are consistent with registered VCS PD.

The organisational role and responsibility as mentioned in the registered VCS PD&MR is followed onsite confirmed during onsite visit. All the emergency preparedness as mentioned in the VCS registered VCS PD&MR is followed onsite and no discrepancies were found regarding the same. Meters are calibrated as per calibration frequency in registered VCS registered VCS PD&MR /4/. All the emergency preparedness as mentioned in the VCS registered VCS PD&MR is followed onsite and no discrepancies were found regarding the same. Thus, completeness of the monitoring plan confirmed and there are no any material discrepancies between the actual monitoring system and the plan provided in the registered VCS PD&MR.

CAR 01 is raised for the inconsistency with respect to MR template guidelines and CAR 02 is raised for supporting evidences for No-Double counting and closed successfully after proper response of PP.

Assessment team confirms following during the verification Onsite Inspection:

1. Start date of the project activity is 13-March-2018 as mentioned in the registered VCS PD&MR^{4/}.
2. An undertaking letter dated 11-April-2023 has been submitted by PP for no double counting with any other GHG program. PP also has given a written declaration that project has not claimed other form of GHG credit for the concerned monitoring period. Assessment team also checked that the projects are not registered under the REC mechanism of India and the same can be cross-checked at <https://recregistryindia.nic.in>. PP has given a written declaration that the credit claimed under VCS for the current monitoring period is not claimed under any other GHG mechanism^{10/}. Further, Assessment team confirms that given project activity is not a supply chain project. Hence, scope 3 emissions are not applicable.
3. Assessment team confirms that this is the 3rd monitoring under VCS and covers the activity from 01-April-2021 to 30-June-2022 (inclusive of both dates). The project activity adopts renewable crediting period of 10 years period. The project start date for this project is 13-March-2018. This is the day on which the first turbine was commissioned^{1/}. 13-March-2018 is the start date and 12-March-2028 will be end date of the crediting period.

The GHG credits from 01-April-2021 to 30-June-2022 will be claimed under VCS only. At any point of time during the crediting period, the project proponent will abide by the “No Double Counting”^{10/}.

4. Assessment team checked and found that the Project proponent of the project activity mentioned in Section 1.3 of monitoring report is correct^{5/}:

Organization name	NHPC Limited
Contact person	Dr. Sujit Kumar Bajpayee
Title	DGM (Environment)
Address	NHPC Limited, NHPC Office Complex, Sector 33, Faridabad - 121003, Haryana, India
Telephone	+91-0129-2278421
Email	cdm-env@nhpc.nic.in

5. Assessment team also checked the details of other entity mentioned in Section 1.4 of monitoring report and found during current monitoring period (01-April-2021 to 30-June-2022), There is a change in other entity as per registered VCS PD. Details of other entity & respective deviation has been provided in section 3.2.2 of this monitoring report. The applied deviation doesn't have any impact on the project applicability, baseline scenario, additionality etc. Hence, accepted.

6. The quantified emission reduction calculation for the monitoring period is correct and conservative. Assessment team also compared actual VER with the estimated VER and found that the actual VER is 1,986,885tCO₂e which is 1.51 % higher than the estimated emission reductions 1,952,988 tCO₂e (1,563,247 tCO₂e/365 days x 456 days) during this monitoring period which is due to higher water availability and less shut down hours of the project activity, compared to expected or estimated in registered VCS PD. Also, as per the sensitive analysis in the registered VCS PD, Project IRR crosses the benchmark if generation is increased by more than 91.99%. Thus, the project activity still remains additional. Hence accepted.

Sustainable development indicators

As a part of regional development efforts associated with the project, PP has supported many education, health & infrastructure related needs for local people. These are funded from the revenue generated from the operation of the project activity. In the absence of project activity, there would be no revenue generated from the project and hence the activity would have not occurred in the absence of the project activity.

Thus, the project activity contributes to the sustainable development of the country.

4.2 Safeguards

4.2.1 No Net Harm

No potential environment or socio-economic matter was found during the documents review of VCS PD&MR and grievance register/^{12/} etc. The project is renewable energy project and thus no negative impact observed due to project activity.

The project activity promotes environmental and socio-economic well-being as it results in zero GHG emissions due to installation and operation of clean, renewable energy technology for electricity generation. The report on “Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects” prepared by MNRE dated September 2013⁴ mentions that hydro power project activity operations do not result in direct air pollution, noise pollution. Assessment team checked and found this appropriate.

However, assessment team still conducted the No net harm assessment for some of the parameters and the result is described below:

⁴ <https://smartnet.niua.org/sites/default/files/resources/report-on-developmental-impacts-of-RE.pdf>

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 stakeholder meetings during Onsite 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.

SL.NO	Indicator	Assessment team opinion
3	Biodiversity	During the Onsite 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 small 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 Onsite audit. 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

Local stakeholder consultation has been conducted at the time of project registration. For on-going stakeholder's communication, PP have maintained grievance register/^{12/} at the site office. All the stakeholders are happy with the implementation and operation of the project activity and no negative comments envisaged for the project activity. Complaint/suggestion/feedback register is maintained at site as a part of ongoing communication with stakeholders in line with clause 3.18.19 of VCS Standard, version 4.4 and appropriate actions taken time to time by PP.

Assessment team checked the grievance register provided by PP and found that local stakeholders can anytime lodge their grievances if any in the register over the operational life time of the project. During current monitoring period no grievance was received. Thus, assessment team is of the opinion that the ongoing stakeholder mechanism is adequate and appropriate. CAR 04 was raised during the verification process and closed successfully. Please refer Appendix 2 of this report for the detail closure of the CAR.

4.3 AFOLU-Specific Safeguards

This section is not applicable as this project activity is a non-AFOLU project activity.

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

Means of verification	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/4/
Findings	CAR 05 was raised during the verification process and closed successfully. Please refer Appendix 2 of this report for the detail closure of the CAR.
Conclusion	As per the registered PD and applied methodology, Formula used to calculate achieved emission reduction is as follow; $ER_y = BE_y - PE_y$ As per registered PD&MR, the build margin and operating margin CO₂ emission factor of Indian grid is taken from Central Electricity Authority: CO₂ Emission Database CEA CO₂ Baseline database Version 18. Thus, $EF_{OM,y} = 0.9610 \text{ tCO}_2/\text{MWh}$ $EF_{BM,y} = 0.8644 \text{ tCO}_2/\text{MWh}$ & $EF_{CM,y} = 0.9126 \text{ tCO}_2/\text{MWh}$ The baseline emissions are calculated as below, $BE_y = EG_{PJ,y} * EF_{grid,CM,y}$ Where; BE_y: Baseline Emissions in year y (tCO₂e) $EG_{PJ,y}$: Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/yr) $EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO₂e/MWh)

	01-Januray 2022 to 30- June-2022	860,209	0	0	860,209
	Total	1,986,885	0	0	1,986,885
	VVB confirmed that GHG reductions and removals have been quantified correctly and in line with monitoring procedure in VCS PD&MR and applied methodology. The estimated emission reduction achieved from the project activity for the current monitoring period is 1,952,988 tCO₂e based on the number of days covered during the current monitoring period which comes out to be 456 days. Whereas the actual emission reductions achieved during the current monitoring period are 1,986,885 tCO₂e. The actual VCUs are 1.51 % higher than the estimated VCUs. This variation is majorly due to higher water availability and less shut down hours of the project activity, compared to expected or estimated in registered VCS PD. Also, as per the sensitive analysis in the registered VCS PD, Project IRR crosses the benchmark if generation is increased by more than 91.99%. Thus, the project activity still remains additional. Hence accepted.				

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

Means of verification	The verification team checked the Calibration details of the monitoring meters with the calibration certificates.
Findings	CAR 6 was raised during the verification process and closed successfully. Please refer Appendix 2 of this report for the detail closure of the CAR.
Conclusion	Assessment team has checked calibration certificates^{11/} and found Energy meters are calibrated once in a five year. As per registered VCS PD & MR, all meters were installed in Feb 2018 by PGCIL and were factory calibrated at the time of installation⁵. The calibration validity of meters is till 2023, hence covering the present monitoring period as well. No delayed calibrations were observed in the project activity for this monitoring period. All the meters are of same accuracy class i.e., 0.2s as per the requirement of the registered VCS PD&MR^{4/}. During Onsite Inspection with O&M personnel also confirms the same. The calculation of net electricity supplied to grid is under purview of state electricity board and PP does not have control on it. Calibration details of the monitoring meters checked with calibration certificates submitted by PP and

⁵<https://registry.verra.org/app/projectDetail/VCS/1891>

	found that delay in scheduled calibration of the installed meters (details mentioned in appendix 05 of this report) for the year 2020 to 2023 (specific date and month varies with each meter). Hence PP has deducted error factor of 0.2% from net amount of generated electricity supplied to the grid for throughout the monitoring period. Same has verified with the calibration certificate and pervious monitoring and verification report. Thus found in line with the para 366 of CDM Validation and Verification Standard for Project Activities, version 3.0. The break down log is checked and there is no major breakdown during the monitoring period. No unforced error observed. No sampling procedure applied for monitoring of the data parameter and entire documents were checked by the assessment team to arrive at positive verification conclusions. The monitoring plan is followed at the project site. The monitoring meters were calibrated in line with the registered monitoring plan and there was no delay in calibration observed. Thus, assessment team concluded that the evidences are sufficient in quantity, and appropriate for the quality, to determine the GHG reductions and removals. Assessment team confirmed that data/ information used for determining GHG reductions and removals were sufficient in quantity and of appropriate quality. Calibration certificates of meters/ QA/QC procedure checked and found to be appropriate.
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4.6 Non-Permanence Risk Analysis

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
NA	NA	NA	NA	NA

5. VERIFICATION OPINION

Applus+ Certification has been engaged^{/02/} by NHPC Limited to perform the 3rd verification (01-April-2021 to 30-June-2022) of the “Kishanganga Hydroelectric Project”.

The project participants are responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions on the basis set out within the project’s monitoring plan in the registered VCS PD&MR ^{/4/} and the applied methodology ACM0002, version 19.

Our verification approach was based on the requirements as defined under the Kyoto Protocol, Marrakesh accord, as well as those defined by the CDM Executive Board. Our approach is risk-based, drawing on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these. Further, 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 document verifications. The entire documents checked/Power plant verification conducted to arrive at positive verification conclusions. The verification team can confirm that:

- the project is operated as planned and described in the project document;
- the monitoring plan is as per the applied methodology;
- the monitoring process in Monitoring Report is as per the VCS PD&MR ^{/4/};
- the development and maintenance of records and reporting procedures are in accordance with the monitoring plan;
- the installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately;
- the monitoring system is in place and generates GHG emission reductions data;
- the GHG emission reductions are calculated without material misstatements.
- A Reasonable Level of assurance was achieved as planned, during verification process.

Verification period: 01-April-2021 to 30-June-2022 (inclusive of both days)

Verified GHG emission reductions and removals in the above verification period, broken down by calendar year:

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-April-2021 to 31-December-2021	1,126,677	0	0	1,126,677

01-Januray 2022 to 30-June-2022	860,209	0	0	860,209
Total	1,986,885	0	0	1,986,885

Estimated ex-ante GHG emission reductions and removals and the achieved emission reductions and removals for this monitoring period:

Year	Ex-ante emissions reductions/re movals	Achieved emissions reductions/r emovals	Percent difference	Justification for the difference
01-April- 2021 to 31- December- 2021	1,177,789	1,126,677	-4.34%	The total achieved Emission Reductions is 1.51% higher than amount estimated ex ante for this monitoring period. The variation is mainly due to higher water availability and less shut down hours of the project activity, compared to expected or estimated in registered VCS PD. Also, as per the sensitive analysis in the registered VCS PD, Project IRR crosses the benchmark if generation is increased by more than 91.99%. Thus, the project activity still remains additional. Hence, accepted.
01-January- 2022 to 30- June-2022	775,199	860,209	10.36%	
Total	1,952,988	1,986,885	1.51%	

APPENDIX 1: DOCUMENTS REVIEWED OR REFERENCED

No.	Author	Title	References to the document	Provider
1.	State Utility	Commissioning certificates for all 3 units of the project activity	Commissioning certificate	PP
2.	Applus	Contract of the project participant with the DOE. Ref. No. A+SH_SYST_TQC_VCS_VER_35622	20-September-2022	PP
3.	NA	Technical specifications of Turbines and Generators	Manufacturer technical specifications	PP
4.	NA	Registered VCS PD&MR and validation report	https://registry.terra.org/app/projectDetail/VCS/1891	PP
5.	NA	Monitoring report Version 01 (Initial) Monitoring report Version 02 Monitoring report Version 04 (Final)	23-September-2022 11-April-2023 27-March-2024	PP
6.	NA	Emission reduction sheet version 01 Emission reduction sheet version 02 Emission reduction sheet Version 03	23-September-2022 11-April-2023 27-March-2024 (Final)	PP
7.	NRPC	Monthly "Deviation Settlement Account document" issued by NRPC for current monitoring period.	-	
8.	NA	Tools/ guidelines used in the project activity - VCS Program Definitions, version 4.3 - VCS standard Version 4.4 - VCS Program Guide 4.3 - VCS verification report template version 4.2		VERRA
9.	State Utility/PP for invoice	JMR as per Monthly Generation Report and Invoices		PP
10.	PP	Declaration regarding no participation in other GHG program for the concerned monitoring period	10-January-2023	PP
11.	NA	Calibration details of the project activity undergoing verification	Calibration certificates	PP
12.	NA	Grievance Register maintained at site	-	PP

No.	Author	Title	References to the document	Provider
13.	UNFCCC	CDM validation and verification standard for project activities, Version 03.0	-	UNFCCC
14.	PP	Shutdown details for the Project Activity Maintenance log book	-	PP
15.	UNFCCC	CDM methodology ACM0002	version 19	UNFCCC
16.	PP	Photographs of Energy meters & Site pic		PP
17.	PP	Power Purchase Agreement	-	PP
18.	VERRA	Previous verification reports	https://registry.terra.org/app/projectDetail/VCS/1891	VERRA
19.	NA	Mail communication between Power Grid Corporation of India and NHPC regarding installation and calibration of meters	Dated- 27-June-2019	PP

APPENDIX 2: CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS (CAR/CL/FAR)

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

FAR ID	00	Section no.		Date :
Description of FAR				
Project participant response				Date :
Documentation provided by project participant				
VVB assessment				Date:

Table 2. CL from this verification

CL ID	00	Section no.		Date :
Description of CL				
NA				
Project participant response				Date:
Documentation provided by project participant				
VVB assessment				Date:

Table 3. CAR from this verification:

CAR ID	01	Section no.		Date: 17-March-2023
Description of CAR				
During review of monitoring report following inconsistencies observed:				
1. In KPI page PP has not provided the complete contact information in line with VCS MR Template guidelines Version 4.1. Thus, corrective action sought. 2. Font size and format in Content page is incorrect. Corrective action sought. 3. PP is requested to submit copies of technical specification details, O&M agreements and training records of the personnel involved in O&M & monitoring of the project activity to assessment team. 4. PP shall revise the name of the grid throughout the MR in line with current scenario of the grid. Thus, corrective action sought. 5. Link provided in footnote 2 and 3 is not functional. Thus, corrective action sought. 6. PP has submitted the commissioning certificate to the assessment team. However, commissioning date of Unit II and Unit III is incorrect in the submitted certificate. PP is requested to submit the certificate inline with the dates mentioned in MR.				
Project participant response				Date: 11-April-2023

1. In KPI page the complete contact information of PP has been provided 2. Font size and format in Content page is Corrected 3. Copies of technical specification details, O&M agreements (Not Applicable) and training records of the personnel involved in O&M has been provided 4. Name of the grid has been revised throughout the MR. 5. Link has been updated in footnote 2 and 3. 6. Commissioning: Kishanganga Hydroelectric Project a. Unit #1: Commissioned on 13.03.2018 b. Unit #2: Commissioned on 21.03.2018 c. Unit #3: Commissioned on 30.03.2018 Central electricity authority - Project Monitoring – Quarterly Review No.98 has been submitted as supporting. (Refer: Chapter- 2.2f, Page 14). The report can also be referred from below weblink (https://cea.nic.in/wp-content/uploads/2020/04/qly98.pdf). Commissioning date are also as per registered VCS PD for the project (https://registry.verra.org/app/projectDetail/VCS/1891)	
Documentation provided by project participant	
• Technical Specification • Central electricity authority - Project Monitoring – Quarterly Review No.98 • Training Record • Monitoring Report (Ver 02) • ER Sheet (Ver 02)	
DOE assessment	Date: 17-April-2023
1. PP has provided the complete contact information of PP under KPI page inline with latest VCS MR Template guidelines. Thus, CAR is Closed. 2. PP has corrected Font size and format in Content page of the revised MR. Thus, CAR is Closed. 3. PP has submitted Copies of technical specification details, and training records of the personnel involved in O&M to the assessment team and training details are found correct. However, the copies of technical specification details are not in line with the details in Joint PD &MR. Thus, CAR is Open. 4. PP has updated the name of the grid throughout the revised MR. Thus, CAR is Closed. 5. Link provided in footnote 2 and 3 is functional now. Thus, CAR is Closed. 6. PP has submitted the revised commissioning certificate of Kishanganga Hydroelectric Project a. Unit #1: Commissioned on 13.03.2018 b. Unit #2: Commissioned on 21.03.2018 c. Unit #3: Commissioned on 30.03.2018 The commissioning dates are now inline with the dates mentioned in registered VCS PD for the project. Thus, CAR is Closed.	
Project participant response	Date: 19-April-2023
3. Updated supporting for technical specification details has been provided	
Documentation provided by project participant	
Technical Specification	
DOE assessment	Date: 20-April-2023
PP has submitted the updated supporting to cross-check the technical specification details mentioned in the revised MR and same is found correct. Thus, accepted. CAR is Closed.	

CAR ID	02	Section no.	1.9	Date: 17-March-2023
Description of CAR				
PP is requested to submit an undertaking for no double counting for current monitoring period and for project activity is participated in other GHG program other than VCS.				
Project participant response				Date: 11-April-2023
Undertaking for no double accounting is provided				
Documentation provided by project participant				

Undertaking for no double accounting	
DOE assessment	Date: 17-April-2023
PP has submitted the undertaking letter for no any double counting for current monitoring period dated 11-April-2023 and for project activity PP not claiming any ERs other than VCS verified by assessment team. Thus, CAR is Closed .	

CAR ID	03	Section no.	1.11	Date: 17-March-2023
Description of CAR				
Table 1 given for Sustainable Development Contributions, in SDG target 4.4 PP has not mention specific numbers of training provided and frequency of the training related to technical and soft skill in MR. Thus, corrective action sought.				
Project participant response				Date: 11-April-2023
Number of trainings has been updated in SDG target 4.4				
Documentation provided by project participant				
Monitoring Report (Ver 02) Training Record				
DOE assessment				Date: 17-April-2023
PP has provided the number of training under SDG target 4.4 and same is cross-checked with the submitted training records and found correct. Thus, CAR is Closed .				

CAR ID	04	Section no.	2.2	Date: 17-March-2023
Description of CAR				
PP requested to submit records for ongoing local stakeholder consultation including grievance register etc. to assessment team.				
Project participant response				Date: 11-April-2023
Copy of grievance register is provided				
Documentation provided by project participant				
grievance register				
DOE assessment				Date: 17-April-2023
PP has submitted Grievance Registers of the all units of the project activity. Assessment team found no major grievances has been made by local stakeholders during current monitoring period. Thus, CAR is Closed .				

Accuracy of GHG Emission Reduction and Removal Calculation

CAR ID	05	Section no.	4.1	Date: 17-March-2023
Description of CAR				
1. In section 4.1 CEA database version is found inconsistent with the approved VCS PD. Thus, corrective action sought. 2. In section 4.2 QA/QC procedures to be applied for Data/Parameter $EG_{PJ,y}$ is not clear about applied calibration. Thus, corrective action sought. 3. PP is requested to submit correct invoices in order to cross-check the monitored values. Moreover, JMRs covering the complete monitoring period is not submitted. Kindly Submit. 4. PP is requested to submit the revised ER sheet with correct date format inline with VCS guidelines. Thus, corrective action sought. 5. PP is requested to provide vintage-wise data for net GHG emission reductions and removals in Section 5.4 of MR. Thus, corrective action sought.				
Project participant response				Date: 11-April-2023

1.	In section 4.1 CEA database version has been updated
2.	In section 4.2 QA/QC procedures for Data/Parameter $EG_{PJ,y}$ has been updated
3.	Copy of Generation Report & Invoice has been provided for complete monitoring period.
4.	ER sheet has been revised to include cross checking mechanism & correct date format.
5.	Vintage-wise data for net GHG emission reductions and removals has been updated in Section 5.4 of MR.
Documentation provided by project participant	
Monitoring Report (Ver 02)	
ER Sheet (Ver 02)	
Generation Report & Invoice for complete monitoring period	
DOE assessment	
Date: 17-April-2023	
1.	PP has updated the CEA database version in Section 4.1 of the revised MR. Thus, CAR is Closed.
2.	PP has updated QA/QC procedures for Data/Parameter $EG_{PJ,y}$ under Section 4.2 of the revised MR. Thus, CAR is Closed.
3.	PP has submitted the JMR/Invoices and ER sheet to the assessment team and the given values are found correct & conservative. Thus, CAR is Closed.
4.	PP has revised the ER -sheet and included the cross-checking mechanism & correct date format. Thus, CAR is Closed.
5.	PP has updated the Vintage-wise data for net GHG emission reductions and removals under Section 5.4 of revised MR. Moreover, PP is requested to provide the vintage -wise data for table 2 under section 5.4. Thus, CAR is Open.
Project participant response	
Date: 19-April-2023	
5. Vintage -wise data for table 2 under section 5.4. has been updated in revised MR	
Documentation provided by project participant	
Monitoring Report (Ver 03)	
DOE assessment	
Date: 20-April-2023	
PP has updated Vintage -wise data for table 2 under section 5.4. in revised MR. Thus, CAR is Closed.	

Quality of Evidence to Determine GHG Emission Reductions and Removals

CAR ID	06	Section no.	4.3	Date: 17-March-2023
Description of CAR				
Details like calibration date and calibration validity date is not clearly mentioned in Section 4.3 of MR. Moreover, in order to verify the calibration details mentioned, PP is requested to submit the copies of calibration certificates covering complete monitoring period to the assessment team.				
Project participant response				
Date: 11-April-2023				
As per registered VCS PD & MR, all meters were installed in 2018 by PGCIL and were factory calibrated at the time of installation. The calibration validity of meters is till 2023, hence covering the present monitoring period as well. The meters & calibration details are updated in Section 4.3 of revised Monitoring Report (https://registry.verra.org/app/projectDetail/VCS/1891)				
Documentation provided by project participant				
Mail communication between Power Grid Corporation of India and NHPC regarding installation and calibration of meters (Dated: 27/06/2019)				
Monitoring Report (Ver 02)				
DOE assessment				
Date: 17-April-2023				
PP has provided Mail communication between Power Grid Corporation of India and NHPC regarding installation and calibration of meters (Dated: 27/06/2019), the meters are calibrated and as per registered VCS PD & MR, all meters were installed in 2018 by PGCIL and were factory calibrated at the time of installation. The calibration validity of meters is till 2023, hence covering the present monitoring period. Thus, accepted. CAR is Closed.				

APPENDIX 3: COMPETENCE OF TEAM MEMBERS AND TECHNICAL REVIEWERS

Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk review	On-site inspection	Interview(s)	Verification findings
1.	Lead Auditor/Technical Expert	OR	PANKAJ	KUMAR	TQC-Outsourced entity	Yes	Yes	Yes	Yes
2.	Auditor	OR	Deepak	Pundlik	TQC-Outsourced entity	Yes	Yes	Yes	Yes

Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer (TR)	EI	Shen	Simon	Applus+ Certification
2.	Approver	IR	Calle de Miguel	Agustin	Applus+ Certification

Short CVs of the Team:

- Mr. Pankaj Kumar** has done M. Sc in Environment Management from Forest Research Institute, Dehradun and B. Sc. (Hons.) in Environment & Water Management from Magadh University, Bihar, India. He has also done Post Graduate Diploma in Environmental Law from NLSIU, Bangalore. He has more than 12 years of working experience in GHG Assessments and has participated during his career in Agencies and DOEs like MITCON, Agrinergy, Carbon Check and is empanelled with Applus+ Certification since 2015 for the performance of CDM/VCS/GS project assessments. He has extensive experience in the Renewable, Waste Management and Energy Demand Scopes of UNFCCC CDM and has done more than 100 Validations and Verifications of PAs and PoAs as Lead Auditor, Technical Expert and Technical Reviewer, mainly in Asia, Africa, USA, Asia Pacific and Americas under CDM, Verified Carbon Standard, Gold Standard & Social Carbon Standard, Brazil. He is an experienced, qualified and result oriented Environment and climate change professional having 16 yrs. of relevant experience in Climate Change (Mitigation & Adaptation), Environmental Due Diligence, Disaster Risk Reduction, Climate finance, adaptation planning, capacity building, validation and verification of GHG project. He can also provide technical support for environmental investigative, remedial projects involving air, water and soil, Waste management, EIA, Environmental Compliance, ISO 14001, OHSAS 18001, GHG accounting (ISO 14064) and

Carbon foot printing. Mr. Pankaj Kumar is based in Patna, India. Mr. Pankaj Kumar may participate as part of the Audit Team as Lead Auditor and Technical Expert for the assessment.

2. **Mr. Deepak Pundlik** has 15 years of experience in climate change, waste management and environmental management. After completing Masters in Environment Sciences from Pune university, He has worked in waste management field. As a GHG consultant, He handled more than 50 projects under renewable energy, waste management sectors during his stint with companies - MITCON and Thermax. Post Thermax, Deepak was involved in organic farming research project with Tata Institute of Social Sciences. As a GHG auditor, He has validated/verified projects under CDM/VCS/GS and GCC mechanisms from renewable energy, energy demand, waste management sectors.
3. **Mr. Simon Shen** (Master's Degree in Thermal Energy Engineering, Bachelor's Degree in Environmental Engineering) is an Auditor appointed by Applus+ LGAI for the GHG project assessment, auditing and technical review. He has more than 6 years of work experience in CDM/GS4GG/VCS project assessment and review with Applus+, apart from the years of experience working as GHG Auditor and ISO 9001/14001 in TUV SUD for 3.5 years before he joined Applus+. Mr. Simon Shen has extensive experience also as former Applus+ Shanghai CDM Technical Manager.

APPENDIX 4: ABBREVIATIONS

Abbreviations	Full texts
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
VER	Verified Emission Reduction(s)
CEA	Central Electricity Authority
CL	Clarification request
CM	Combined Margin
CMS	Central Monitoring system
CO ₂	Carbon dioxide
CO _{2e}	Carbon dioxide equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
DR	Document Review
EF	Emission Factor
EIA	Environmental Impact Assessment
ER	Emission Reductions
FAR	Forward Action Request
GHG	Greenhouse gas(es)
PP	Project Participant
PLF	Plant Load Factor
MR	Monitoring Report
JMR	Joint Metering Report
PPA	Power Purchase Agreement
VCS	Voluntary Carbon Standard
VVB	Validation and Verification Body

APPENDIX 5: CALIBRATION DETAILS

Meter ID no-	Make	Place of Installation	Meter Sr.No.	Meter type	Accuracy Class	Calibration Date	Calibration Validity Date
KG-01	Elster	220 kV Amargarh-1	NR-3292-A	Main	0.2s	17-November-2015	16-November-2020
						16-September-2023	15-September-2028
KG-02	Elster	220 kV Amargarh-1	NR-3314-A	Check	0.2s	17-November-2015	16-November-2020
						16-September-2023	15-September-2028
KG-03	Elster	220 kV Amargarh-2	NR-3504-A	Main	0.2s	17-December-2015	16-December-2020
						13-September-2023	12-September-2028
KG-04	Elster	220 kV Amargarh-2	NR-3236-A	Check	0.2s	05-October-2015	04-October-2020
	Schneider		WR-2169-A			13-June-2022	12-June-2027
KG-05	Elster	220 kV Wagoora-1	NR-3241-A	Main	0.2s	05-October-2015	04-October-2020
						13-September-2023	12-September-2028
KG-06	Elster	220 kV Wagoora-1	NR-3243-A	Check	0.2s	05-October-2015	04-October-2020
						13-September-2023	12-September-2028
KG-07	Elster	220 kV Wagoora-2	NR-3245-A	Main	0.2s	05-October-2015	04-October-2020
	Schneider		WR-2167-A			13-June-2022	12-June-2027
KG-08	Elster	220 kV Wagoora-2	NR-3247-A	Check	0.2s	05-October-2015	04-October-2020
						13-September-2023	12-September-2028
KG-09	Elster	GT-1 (220kV)	NR-3258-A	Stand by	0.2s	05-October-2015	04-October-2020
						15-September-2023	14-September-2028
KG-10	Elster	GT-2 (220kV)	NR-3288-A	Stand by	0.2s	17-November-2015	16-November-2020
						15-September-2023	14-September-2028
KG-11	Elster	GT-3 (220kV)	NR-3291-A	Stand by	0.2s	17-November-2015	16-November-2020
	Elster		NR-3493-A			15-February-2020	14- February-2025
KG-12	Elster	220 kV Aux Transformer (220kV/33kv)	NR-3325-A	Stand by	0.2s	17-November-2015	16-November-2020
						16-September-2023	15-September-2028

As per registered VCS PD & MR, all meters were installed in 2018 by PGCIL and were factory calibrated at the time of installation⁶. However, Date of calibration of pre-calibrated meters installed initially was of year 2015. Then, next calibration of meters except KG-4, KG-7 & KG-11 done in the year of 2023. Same has been confirmed through meter calibration certificates.

Further, during review, VVB team observed that due to technical issue with the meters KG-4, KG-7 & KG-11 is replaced with new pre-calibrated meters. Same has been confirmed with meter calibration certificates and previous monitoring and verification report. Thus accepted.

Due to Late calibration of installed meters, delay in scheduled calibration has been observed throughout the monitoring period, thus error factor (i.e., 0.2%) has been deducted from net electricity supplied to the grid (i.e, $EG_{pj,y}$) for the period 01-April-2021 to 30-June-2022, in accordance with the para 366 of CDM Validation and Verification standard for project activities, version 3.0. t

⁶<https://registry.verra.org/app/projectDetail/VCS/1891>