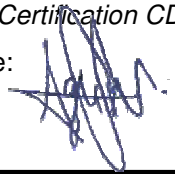
Verification and certification report form for CDM project activities

(Version 04.0)

BASIC INFORMATION	
Title and UNFCCC reference number of the project activity	Run-of-the-river Hydroelectric Power Project in Uttarakhand by Alaknanda Hydro Power Company Limited (UNFCCC Ref. No. 4776)
Scale of the project activity	☒ Large-scale ☐ Small-scale
Version number of the verification and certification report	01
Completion date of the verification and certification report	03/07/2021
Monitoring period number and duration of this monitoring period	01 (15/03/2013 to 31/08/2016; both days included)
Version number of the monitoring report to which this report applies	02
Crediting period of the project activity corresponding to this monitoring period	15/03/2013 – 14/03/2023 (Fixed)
Project participants	M/s Alaknanda Hydro Power Company Limited
Host Party	India
Applied methodologies and standardized baselines	ACM0002. ver. 12.1.0 – Consolidated methodology for grid-connected electricity generation from renewable source **Standardized Methodology**: Not Applicable
Mandatory sectoral scopes	1: Energy industries (renewable / non-renewable sources)
Conditional sectoral scopes, if applicable	NA
Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD	1,510,627 tCO_2e

Certified amount of GHG emission reductions or GHG removals for this monitoring period	Amount before 1 January 2013	Amount from 1 January 2013 until 31 December 2020	Amount from 1 January 2021
	0 tCO_2e	1,444,019 tCO_2e	0 tCO_2e

Name and UNFCCC reference number of the DOE	LGAI Technological Center, S.A. (Applus+ Certification) UNFCCC Ref. No.: E-0032

Name, position and signature of the approver of the verification and certification report	Mr. Agustín Calle de Miguel *Applus+ Certification CDM Technical Manager* Signature: 

SECTION A. Executive summary

M/s Alaknanda Hydro Power Company Limited (AHPCL) has commissioned LGAI Technological Center, S.A. (Applus+ Certification) – Hereinafter referred as Applus+ Certification, to perform a 1st verification of the "Run-of-the-river Hydroelectric Power Project in Uttarakhand by Alaknanda Hydro Power Company Limited" in India. The project activity located on Alaknanda River, a major tributary of the Ganga River, a perennial river in Uttarakhand. The project site is 110 km from Rishikesh railhead, along Rishikesh - Badrinath highway.

The Project activity installed 4 no's generating units of 82.5 MW each, which makes total capacity of 330 MW 'run of the river' hydropower project in Uttarakhand.

The purpose of the project activity is construction and operation of a grid connected renewable electricity generation hydroelectric power plant. The project activity reduces the GHG emission by use of a clean, renewable (hydropower) source for power generation in place of common fossil fuels. The project activity reduces the dependence on fossil fuel of the Indian GRID, which is dominated by emission intensive coal based thermal power plants. The project activity involves construction of a concrete gravity diversion weir across the river Alaknanda, and its left bank construction stage diversion tunnel, an intake on right bank consisting of 6 numbers intake tunnels joining two Head Race Tunnels (HRT) through a manifold section, of 9.8 m dia. circular head race tunnel followed by a RCC cut and cover conduit crossing the supana nallah, a desilting basin followed by power channel, fore bay, power house, tail race channel and switchyard.

The project activity is evacuating the power generated from the project activity into four feeders at 400 KV at Srinagar, Vishnuprayag and Muzzfarnagar. The assessment team checks the same during the verification site visit.

Assessment team also observed that there is no change in design/technical parameter as mentioned in the registered PDD and thus the same is found correct. No design change observed for the current monitoring period and the rated capacity as mentioned in the registered PDD is implemented onsite and thus the same is acceptable and correct for the current monitoring period. No PRC change is thus envisaged for the current monitoring period.

During the monitoring period 15/03/2013 to 31/08/2016[1]; (inclusive of both days) the project activity has achieved emission reductions 1,444,019 tCO_2e.

1. Verification Scope: The verification scope encompasses an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the DOE. The verification is based on the submitted monitoring report, the validated and registered PDD as well as its validation report, the applied monitoring methodology, relevant decisions, clarifications and guidance from the CMP and the EB and any other information and references relevant to the project activity's resulting emission reductions. These documents are reviewed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures and related rules and guidance. Based on the requirements in the "CDM validation and verification standard for project activities, Version 02.0", Applus+ Certification has applied a rule-based approach for the verification of the project. The principles of accuracy, completeness, relevance, reliability and credibility were combined with a conservative approach to establish a traceable and transparent verification opinion. The verification considers both quantitative and qualitative information on emission reductions. The verification is not meant to provide any consultancy towards the client. However, stated requests for clarifications, corrective and/or forward actions may provide input for improvement of the monitoring activities.

2. Methodology:

LGAI Technological Center, S.A. (Applus+ Certification) – Hereinafter referred as Applus+ Certification - approach to the verification is a two-stage process.

In the 1st stage, Applus+ Certification completed a strategic review and risk assessment of the project's activities and processes in order to gain a full understanding of:

[1] The crediting period of the project started from 15/03/2013 however since the commissioning of the project was delayed hence the JMR was issued from 01/06/2015 hence the comparison is being done based upon the actual number of days the project was operational during current monitoring period.

- Activities associated with all the sources contributing to the project emissions and emission reductions, including leakage if relevant;
- Protocols used to estimate or measure GHG emissions from these sources;
- Collection and handling of data;
- Controls on the collection and handling of data;
- Means of verifying reported data; and
- Compilation of the monitoring report.

Applus+ Certification used a Periodical Verification Checklist which, based on the risk-based assessment of the parameters and data collection and handling processes for each of those parameters, describes the verification approach and the sampling plan.

3. Desk Review

In the 2nd stage, using the Verification Checklist, Applus+ Certification verified the implementation of the monitoring plan and the data presented in the Monitoring Report for the period in question. This involved a site visit and a desk review of the Monitoring Report. This Verification Report describes the findings of this assessment.

The Monitoring Report version 01 submitted by the PP was made publicly available on the UNFCCC website before the verification activities started. The published MR was assessed based on all the relevant documents. The aim of the assessment in the desk review was to:

- Verify the completeness of the data and the information presented in the MR;
- Check the compliance of the MR with respect to the monitoring plan depicted in the registered PDD and verify that the applied methodology was carried out. Particular attention to the frequency of measurements, the quality of the metering equipment including calibration requirements, and the quality assurance and quality control procedures was paid;

Evaluate the data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

4. Assessment team

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

The composition of audit team shall be approved by the LGAI Technological Center, S.A. (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
Dr. Atul Takarkhede	LA/TE	YES	YES	NA
Mr. Denny Xue	TR	YES	YES	NA

The curriculum vitae of the DOE's Verification team members is provided in Appendix 2 of this report.

5. Review of Documentation:

The Monitoring Report version 01 submitted by the PP was made publicly available on the UNFCCC website before the verification activities started. The published MR was assessed based on all the relevant documents. A cross-check between information provided and information from other sources has been done. A complete list of documents reviewed is available in Appendix 3 of this report.

6. On-site Assessment and follow-up Interviews:

As a part of the verification, the Remote audit (detailed out in Section D.2) has been performed by the assessment team.
The objective of the on-site assessment is to:

- Confirm the implementation and operation of the project;
- Review the data flow for generating, aggregating and reporting the monitoring parameters;
- Confirm the correct implementation of procedures for operations and data collection;
- Cross-check the information provided in the MR documentation with other sources;
- Check the monitoring equipment against the requirements of the PDD and the approved methodology, including calibrations, maintenance, etc.
- Review the calculations and assumptions used to obtain the GHG data and ER;
- Identify if the quality control and quality assurance procedures are in place to prevent or correct errors or omissions in the reported parameters.

The details are mentioned in section D.2 of this report.

7. Quality of Evidences

Sufficient evidence covering the full verification period in the required frequency is available to verify the figures stated in the final MR. The source of the evidences will be discussed in Appendix 3 of this report. Specific cross-checks have been done in cases that further sources were available. The monitoring report's figures were checked by the assessment team against the raw data. The data collection system meets the requirements of the monitoring plan as per the methodology.

8. Reporting of Findings

As an outcome of the verification process, the assessment team can raise different types of findings.

Where a non-conformance arises the assessment team shall raise a Corrective Action Request (CAR). A CAR is issued, where:

a) Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants;
b) Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions;
c) Issues identified in a FAR during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.

The assessment team shall raise a Clarification Request (CL) if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

All CARs and CLs raised during verification shall be resolved prior to submitting a request for issuance.

Forward Action Requests (FARs) may be raised during verification for actions where the monitoring and reporting require attention and/or adjustment for the next verification period. All the CARs/CLs/FARs are being discussed in Appendix 4 of this report.

9. Internal Quality Control

As a final step of verification, the final documentation including the verification report has to undergo an internal quality control by the Technical Reviewer. Each report has to be finally approved either by the DOE's Technical Manager or the Deputy. In case one of these two persons is part of the assessment team, the approval can only be given by the person who is not a part of the assessment team. If the documents have been satisfactorily approved, the request of issuance is submitted to CDM EB along with the requisite documents.

SECTION B. Verification team, technical reviewer and approver

B.1. Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Verification findings
1.	Lead Auditor/Technical Expert	OR	Takarkhede	Atul	True Quality Certifications Private Limited-Outsourced entity	Yes	No	Yes	Yes

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

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

SECTION C. Application of materiality

C.1. Consideration of materiality in planning the verification

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Human errors: Readings from Meters (if not automatic)	LOW	Human error is likely to occur if the monitoring personnel are not trained well or inexperienced in data recording procedures and monitoring processes.	All the personal are well trained to monitor and collect data and thus risk associated with Human error is minimized. Assessment team checked the training records to confirm that all the personal are well trained to handle the activities related to monitoring. Assessment team checked the training records for the complete monitoring period and confirm that the personal are well

				trained to monitor and collect data for the project activity.
2	Human error: Quantification of emission reduction	LOW	Use of spreadsheets without adequate data control, changes/updates, version tracking, traceability and security	All the JMR (Monthly meter report/Generation Report) sheets and the invoices/Obligation Reports for the complete monitoring period are checked and thus the assessment team confirms that the ER value is conservative and correct.

C.2. Consideration of materiality in conducting the verification

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. There are no material errors, overestimation of ER, omission or misstatement.

SECTION D. Means of verification

D.1. Desk/document review

The verification was performed primarily based on the review of the monitoring report and the supporting documentation. This process included review of data and information presented to verify their completeness and review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment used to include calibration requirements, and the QA/QC procedures, and an evaluation of data management and the QA/QC system in the context of their influence on the generation and reporting of emission reduction.

The initial MR Version 01 submitted by the project participant and additional background documents related to the emission reductions are reviewed as an initial step of the verification process. The subsequent step involved the identification of corrective action requests, clarification requests and Forward action request (CAR, CL and FAR) which are presented in Appendix 4 of this report. As a result of these findings, the MR is revised & submitted to assessment team. A complete list of all documents and records reviewed is as attached in Appendix 03 of this report.

D.2. On-site inspection

No Physical verification was conducted by the DOE for this CDM verification due to high threat of COVID-19 in entire state of India. Government of India has ordered nationwide lockdown from 25/03/2020[2]. Latter during second wave of pandemic it was further imposed by various state governments state-wise lockdown and quarantine rules[3]. State of Uttarakhand has imposed various restrictions on public activities & travelling.

Hence, in line with the guidance to relax mandatory site visits by DOEs due to COVID 19 pandemic published by UNFCCC, DOE has taken alternative measures to arrive at conservative estimation of emission reductions achieved, applying standard auditing techniques for verification, as referred in section 9.1.3 of the "CDM validation and verification standard for project activities, Version 02". Moreover, as verified from the ERPA provided by PP, PP has commitment of supplying of CERs to buyer by 11/07/2021. So, the site visit cannot be postponed to a later date. Thus, as per guidance to relax mandatory site visits by DOEs due to COVID 19 pandemic, assessment team have conducted remote audit and used standard auditing techniques to verify information and compliance with applicable requirements to the extent possible, to ensure the completeness and credibility of the audit.
The remote audit was conducted through Skypes and audit was attended by Site In-charge of both sites as well as consultants. Details of attendees is given below in section D.3.
The topics discussed during the remote audit is given in below table and explained in detailed latter part

[2] https://www.mha.gov.in/sites/default/files/MHADOLrDt_3052020.pdf
[3] https://www.hindustantimes.com/india-news/uttarakhand-extends-covid-19-lockdown-till-june-29-check-what-is-allowed-101624185459536.html https://www.hindustantimes.com/india-news/uttarakhand-extends-covid-19-lockdown-till-june-29-check-what-is-allowed-101624185459536.html

Duration of on-site inspection: 05/06/2021(Remote Audit through Skype)				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	The verification team conducted visit to the project site to confirm the information and to resolve issues identified in the document review. An on-site assessment was conducted as a part of verification activity and involved: 1) an assessment of the implementation and operation of the CDM project activity as per the registered PDD 2) a review of information flows for generating, aggregating and reporting of the monitoring parameters 3) interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the Monitoring Plan 4) a cross-check between information provided in the MR and data from other sources 5) a check of the monitoring equipment including calibration performance, and observations of monitoring practices against the requirements of the PDD and the applied methodology 6) a review of calculations and assumptions made in determining the GHG data and ERs, and 7) an identification of QA/QC procedures in place to prevent, or identify and correct, any errors or omissions in the reported monitoring parameters	Tehri Garhwal and Pauri Garhwal Districts, Uttarakhand State, India (Remote Audit)	05/06/2021	Dr. Atul Takarkhede

As referred above, the objective of the remote assessment was to verify the following issues:

- Confirm the implementation and operation of the project in line with CDM PDD: the project activity is implemented as per the registered PDD and there is no change in capacity or design of the project activity since commissioning. Same was confirmed from commissioning certificates, technical specifications of the turbines & recent site photographs, PPA, interviews with PP/Site in charge and JMR as well as invoices raised by PP towards state utility;
- Review the data flow for generating, aggregating and reporting the monitoring parameters: JMR procedures are followed at the project site in line with the state utility practice and is in line with the registered PDD. JMR procedure is confirmed during the interviews with PP and assessment team also checked entire monthly JMRs issued by the state utility for the project activity with the values provided in the ER sheet for the calculations of the emission reductions;
- Confirm the correct implementation of procedures for operations and data collection: during interviews with PP it was confirmed that implementation of procedures for operations and data collection is in line with registered PDD;
- Cross-check the information provided in the MR documentation with other sources: the information provided in the MR was crosschecked with the commissioning certificates, PPA, calibration certificates and JMRs are issued by Statutory authority and invoices are used for cross-checking;

- Check the monitoring equipment against the requirements of the PDD and the approved methodology, including calibrations, maintenance, etc.: monitoring meters are cross checked with the previous verification reports, interviews with PP, current photographs/videos submitted by PP and calibration is checked with the calibration certificates issued by State Utility authorized third parties;
- Review the calculations and assumptions used to obtain the GHG data and ER: calculation procedures and monthly generation data is checked with JMR and crosschecked with invoices;
- Identify if the quality control and quality assurance procedures are in place to prevent or correct errors or omissions in the reported parameters: during interviews with PP it was confirmed that quality control and quality assurance procedures are in place. Metering arrangements & JMR procedure is defined and controlled by state utility and PP do not have control on it. Assessment team checked all the monthly JMR values as well as crosschecked with the invoices and found that emission reductions are calculated conservatively.

Thus, to verify the implementation of project activity, onsite operation & maintenance, monitoring & management practices; assessment team has conducted skype call/telephonic interviews with onsite in-charge, O&M team and also had a detail discussion with the PP representative and reviewed third party statutory documents i.e. Commissioning certificates, Power Purchase Agreement, Complete set of JMRs covering monitoring period, Invoice (for cross check of Net electricity supplied to the grid as per revised PDD), training records, breakdown log, O&M schedule, complaint/feedback register and other relevant records.

After telephonic/Skype interviews with concerned onsite persons, document reviews & site videos/photographs submitted by PP; assessment team concluded that the project activity is still implemented and operated in-line with the registered PDD. There is no change in the project design or operation and monitoring practices at site which can alter the applicability of meth or additionality of the project activity. In addition to the interviews with PP, assessment team have checked the commissioning certificate, PPA and JMRs and found that the project activity is implemented as per the PDD, and Monitoring report submitted by the PP for current monitoring period. From review of JMR and invoices assessment team therefore of the opinion that project is implemented as described in the registered PDD and there is no change in monitoring practices as well as all monitoring parameters as envisaged in the PDD. All the monitored values are supported by the evidences i.e. JMRs and found that information provided in the MR is inline with the submitted evidences. Assessment team reviewed all the calibration certificates and found that monitoring meters are calibrated periodically. Detailed assessment provided later in Section E.7 of this report.

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Verma	Mr. Aditya	Project Participant	05/06/2021	As mentioned above in section D.2 of this report	Dr. Atul Takarkhede
2.	-	Ms. Dhriti	PP Representative	05/06/2021		
3.	Dutta	Bhaskar	DGM-Operations, EKI Energy Services Ltd	05/06/2021		

D.4. Sampling approach

No sampling is used as the verification team has visited site along with the substations. The verification team has reviewed all the documents like commissioning certificates, JMR (monthly reports) sheets, invoices, etc.

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

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form	00	01	00
Compliance of the project implementation and operation with the registered PDD	00	01	00
Post-registration changes	00	00	00
Compliance of the registered monitoring plan with the	00	00	00

methodologies including applicable tools and standardized baselines			
Compliance of monitoring activities with the registered monitoring plan	00	02	00
Compliance with the calibration frequency requirements for measuring instruments	00	01	00
Assessment of data and calculation of emission reductions or net removals	00	01	00
Assessment of reported sustainable development co-benefits	00	00	00
Global stakeholder consultation	00	00	00
Others (please specify)	00	00	00
Total	**00**	**06**	**00**

SECTION E. Verification findings

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

Means of verification	The verification team has determined whether the monitoring report was completed using the valid version of the applicable monitoring report form. The verification team has checked whether all the sections of the monitoring report follow the guidelines provided in the template
Findings	CAR 01 was raised during the verification process. Please refer Appendix 4 of this report for the complete closure of the CAR.
Conclusion	The MR was web hosted in version 08.0 of the MR form which was the activate version in the UN platform. The monitoring report has been prepared as per the instructions provided in the template. DOE has made the version 01 of the monitoring report covering the monitoring period 15/03/2013 to 31/08/2016; (both the days included) publicly available through its dedicated interface on the UNFCCC CDM website on 19/04/2021 i.e., before undertaking the site visit for the verification. However, the monitoring report was completed using version 08 following the guidelines contained in the template which is valid and active version of monitoring report at the time of submission of issuance of CERs request. Thus, the verification team has concluded that the monitoring report was completed using the valid version 8 of the applicable monitoring report template. However, CAR 01 was raised for editorial mistakes, MR template guidelines and supporting documents. CAR was closed on revision of the MR & document submission for this CAR.

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

This is 1st periodic verification for crediting period of the project activity. NO FAR was raised during the validation and previous verification of the project activity. Same is verified from validation report and previous verification report.

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

Means of verification	The verification team determined the conformity of the actual implemented project activity and its operation with the registered project design document. DOE has, by means of a desk review and an PP interviews & document review, assessed whether all physical features of the proposed CDM project activity proposed in the registered PDD are in place, and that the project participants have operated the CDM project activity as per the registered PDD.
Findings	CAR 02 was raised during the verification process that was closed successfully. Please refer Appendix 4 of this report for the detailed closure of the CAR
Conclusion	The verification team has reviewed the commissioning certificates (commissioning date: Commissioning of the project done on 23/04/2015, 21/06/2015, 02/05/2015 & 21/06/2015) to conclude that the capacity of the project is same as mentioned in the registered PDD. The capacity does not change after the registration of the project activity as confirmed by the assessment team during verification site visit. The project is a Large-scale project activity (Rated Capacity is greater than or equal to 15 MW) and the DOE confirm the same during the onsite visit. No post

registration changes are envisaged for the present monitoring period. The project activity is in continuous operation and undergone scheduled maintenance and operation for the concerned monitoring period. No unforeseen incident observed during the monitoring period, which can affect the applicability or additionality of the methodology. Assessment team checked and confirm from the plant breakdown log sheets apart from scheduled maintenance (as per manufacturer specification) no any forced incident occurred which can alter the applicability of the methodology.

Assessment team checked the major milestone for the project and the same to be found correct. The supporting documents for all the major milestone is checked and found correct by the assessment team. The details are as below:

1. PPA signed and DPR completed in 2000
2. Techno Economic Clearance obtained from Central Electricity Authority in 2000
3. Quotation received for Civil and Mechanical works in 2004
4. Board Resolution to implement the project activity 13/11/2005
5. Letter of intent issued for construction work 26/04/2006
6. Implementation agreement between Alaknanda Hydro, Govt of Uttarakhand and Govt. of Uttar Pradesh signed on 10/02/2006
7. Implementation work started on 26/04/2006
8. Commissioning of the project done on 23/04/2015, 21/06/2015, 02/05/2015 & 21/06/2015

Assessment team checked the technical details of the power plant from the manufacturer brochure and checked the specifications during the remote audit from the name plate readings. The technical details of the power plant are same as mentioned in the registered PDD and no change or deviation is observed in power plant design. The technical details are as follows:

GENERATOR:

Parameter	Value
Make	BHEL
Rated power	82.5 MW * 4
Average lifetime	30 years
Efficiency	98%
Rated Voltage	13.8 kV, Range ±10%
Frequency	50 Hz +3% to -5%
Excitation	Static type
Power Factor	Rated PF (lagging) – 0.85

The generators' continuous overload output is 90.75 MW. The generator stator and rotor windings are provided with epoxy insulation of class 'F'. The generator ventilation system would be of closed recirculation type with air cooled by water. The generator shall be designed to withstand the runaway speed which shall be co-ordinated with the turbine supplier.

The bearing arrangement comprise a turbine guide bearing and a thrust cum guide bearing below the generator rotor. This bearing arrangement is recommended in view of comparatively low speed of rotation. Generation of power at 13.8 kV is stepped up to 400 kV by a power transformer. The arrangement for Power Evacuation from Shrinagar Hydro Power Station is as below:

1. One circuit of 400 kV Muzaffarnagar-Vishnuprayag line may be made with line in and line out (LILO) at the Switchyard of Shrinagar Power House.
2. One double circuit connected from Srinagar Power House substation to PTCUL substation at Shrinagar.

Turbine details:

Parameter	Value
Make	BHEL
Rated Power	82.5 MW * 4
Average lifetime	35 years
Efficiency	93.36%
Turbine head range	Normal: 65 m Max: 68 m Min: 63 m

Considering modern practices for designing of Francis Turbines, particularly in view of susceptibility to erosion of turbine parts due to silt in river water, the essential turbine parts such as runners, guide vanes, facing plates, labyrinth rings shall be coated with a resistance layer of hard ceramic material embedded in a ductile matrix. Each turbine would be fed by individual penstocks from fore bay and controlled by Electro-hydraulic modern type governors. The Runners, Labyrinth seals, Guide vanes are envisaged to be of stainless steel to minimize erosion. Runners and Guide vanes shall be 13/4 Chrome Nickel steel.

Each of the four turbines have rated capacity 82.5 MW with 10% continuous overloading and maximum output of 92.95 MW.

The generator is proposed to be a vertical shaft synchronous machine with rated continuous output of 97.06 MVA, having rotational rated speed of 166.66 rpm and run-away speed of 315 rpm to match with that of turbine

The latitude and longitude of the project are as follows:

Latitude: 30° 14' 20" N
Longitude: 78° 50' 01" E

The above details ate checked by the assessment team during the verification site visit, latitude and longitude are also checked via Google earth, and GPS meters during the site visit. The detail also forms the part of Monitoring report and thus acceptable to the assessment team. Assessment team confirm that the power plant is evacuating the power generated from the project activity into four feeders at 400 KV at Srinagar, Vishnuprayag and Muzzfarnagar.

Based on the documentary evidence of commissioning certificates and remote verification DOE concludes that the project was implemented as per the registered PDD.

E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents[4]

Not applicable for present Monitoring period. PP has not applied any type of deviation.

E.4.2. Corrections

Correction has been made in the registered PDD and same was approved on 14/01/2021 with PRC ref. PRC-4776-001.
https://cdm.unfccc.int/PRCContainer/DB/prcp749583822/view .

E.4.3. Changes to the start date of the crediting period

This is 1st periodic verification. The project activity involves change in start date of crediting period.
The start date of crediting period is already changed from: 15/03/2012 – 14/03/2022 to 15/03/2013 – 14/03/2023 (Fixed): https://cdm.unfccc.int/Projects/DB/BVQI1304680909.79/view

[4] Other standards, methodologies, methodological tools and guidelines (to be) applied in accordance with the applied(selected) methodologies are collectively referred to as the other (applied) methodological regulatory documents).

E.4.4. Inclusion of a monitoring plan

Not applicable for present Monitoring period.

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

Permanent changes has been made in the registered PDD and same was approved on 14/01/2021 with PRC ref. PRC-4776-001.
https://cdm.unfccc.int/PRCContainer/DB/prcp749583822/view .

E.4.6. Changes to the project design

Not applicable for present Monitoring period

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

Not applicable being renewable energy project

E.5. Compliance of the registered monitoring plan with applied methodologies, applied standardized baselines, and other applied methodological regulatory documents

Means of verification	The verification team determined whether the registered monitoring plan is in accordance with the applied methodology ACM0002. ver. 12.1.0 including applicable tools.
Findings	There is no CAR/CL raised in this section.
Conclusion	The verification team is able to confirm that the monitoring plan contained in the registered PDD is in accordance with the approved methodology applied by the project activity, i.e., ACM0002. ver. 12.1.0 and its applicable tools. The same is followed onsite and thus assessment team confirms that project activity comply with the requirement of Approved methodology and registered PDD.

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

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

Means of verification	The assessment team checked the registered PDD and found that a parameter EG_y is considered as Ex-ante and Ex-post parameter both. Similar is not found appropriate thus Project proponent considered EG_y as only ex-post monitoring parameter. Assessment team also interviewed the personal onsite to check further regarding the ex-ante values used for emission reduction calculation.
Findings	CAR 03 was raised during the verification process and closed successfully. Please refer Appendix 4 of this report for the detail closure of the CAR.
Conclusion	$\mathbf{EF_{electrical}}$; $\mathbf{EF_{BM,y}}$; $\mathbf{EF_{OM,y}}$; $\mathbf{EF_{Res}}$; $\mathbf{EF_{diesel,CO2}}$ & $\boldsymbol{\rho_{diesel}}$ were mentioned as ex-ante fixed parameter. Assessment team checked the values, source of data, choice of data, purpose of the data mentioned in the MR from the registered PDD and confirms that the similar approach was considered for the current monitoring period also. 1. $\mathbf{EF_{OM,\ y}}$: (=1.0086tCO_2/MWh): Operating Margin emissions factor for grid connected power generation in year y calculated using the version of "Tool to calculate the emission factor for an electricity system." $EF_{OM,\ y}$ is computed using the Simple Operating margin CO_2 emission factor. Simple Operating margin CO_2 emission factor is calculated from the weighted average CO_2 emissions per unit net electricity generation of all power plants serving the system, not including low-cost / must-run. This is in agreement with the guidance provided in the Tool to calculate the emission factor for an electricity system. The value is considered from CEA version 04 and revised PRC-PDD. Assessment team checked the registered PDD and found that value considered for emission reduction calculation in this present monitoring period is sourced from the registered PDD. Thus assessment team conclude that the emission reduction calculation for the present monitoring period is conservative and correct. 2. $\mathbf{EF_{BM,\ y}}$: (=0.5977 tCO_2/MWh): Build Margin emissions factor for grid

	connected power generation in year y calculated using the latest version of "Tool to calculate the emission factor for an electricity system. Build margin emission factor is the generation-weighted average emission factor of all power plants *m* during the most recent year *y* for which generation data is available. Tool to calculate the emission factor for an electricity system is used to calculate $EF_{BM, y}$. The value is considered from CEA version 04 and registered PDD. Assessment team checked the registered PDD and found that value considered for emission reduction calculation in this present monitoring period is sourced from the registered PDD. Thus assessment team conclude that the emission reduction calculation for the present monitoring period is conservative and correct. 3. **$EF_{electricity}$** (=0.8032 tCO_2/MWh): Combined Margin emissions factor for grid connected power generation in year y calculated using the version of "Tool to calculate the emission factor for an electricity system." $EF_{electricity}$ is computed using the official data sources and is in-line with the guidance provided in the tool. The value is considered from CEA version 04 and revised PRC PDD. Assessment team checked the registered PDD and found that value considered for emission reduction calculation in this present monitoring period is sourced from the registered PDD. Thus assessment team conclude that the emission reduction calculation for the present monitoring period is conservative and correct. 4. **EF_{Res}** : The default emission factor suggested in the methodology applied for the parameter and the same is acceptable to the assessment team. The default value as per EB23 is 90 $kgCO_2e$/MWh. The same is thus acceptable to the assessment team 5. **$EF_{diesel,CO2}$**: The value is taken from the database developed by Central Electricity Authority (CO_2 Baseline database for the Indian power sector, Version 6.0). The database is Government of India's official publication based on the 'Tool to calculate the emission factor for an electricity system'. Version 04 of the CEA database was valid during the project registration and thus 0.0726 tCO_2/GJ value is thus acceptable to the assessment team 6. 7. **ρ_{diesel}:** The Specifications of diesel in country as per latest Bharat Stage IV/ Euro IV Vehicular Emissions Norms. This is national level default (as part of fuel specifications) and PP is likely to use same quality fuel for the DG set. Hence, 845.0 kg/m^3 is thus acceptable to the assessment team for the parameter. The value for $EF_{electricity}$, $EF_{BM,y}$, $EF_{OM,y}$ were considered from the CO_2 baseline database (Version 04) published by Central Electricity Authority (CEA). The default value as mentioned in the registered PDD and MR are same. The value of combined margin in India is being given by CEA and thus assessment team conclude that the value is correct and appropriate. The default value in turn is used for baseline calculation as per the formula given in the registered PDD for the current monitoring period. However, CAR 03 was raised to rectify value for ex-ante parameter "$EF_{OM,y}$" in monitoring report. CAR was closed on revision of the MR.

E.6.2. Data and parameters monitored

Means of verification	The assessment team checked the registered PDD to confirm the ex-post parameter mentioned in the current monitoring report. Assessment team also interviewed the personal onsite to check further regarding the ex-post parameter monitoring and confirms that the same is in line with the registered PDD. ACM 0002 version 12.1.0 which was the applied methodology during the registration of the project is also checked to ensure that monitoring parameter as mentioned in the registered PDD and current MR are in compliance with the methodology.

Findings	CAR 04 was raised during the verification process and closed successfully. Please refer Appendix 4 of this report for the detail closure of the CAR.
Conclusion	As per the registered monitoring plan and requirement of the registered methodology following parameters needs to be monitored: 1. **$EG_{facility,y}$**: The net electricity supplied by the project activity to grid The parameter is a calculated using the difference of export and import value measured from the electricity meter. The source of data of the parameter is Measured by the meter and as noted in the JMR provided by the agency. Electricity export and import is measured via Bi-directional electricity meter installed on the high-tension side of the transformer and the value of export and import forms the part of Meter reading statement issued by State electricity board. JMR also mentions direct value of net electricity generation and supplied to grid and same value is considered as monitoring parameter and used for ER calculations. The meter reading is taken during a fixed billing cycle of every month and representative of state electricity board and Operation and maintenance personal onsite present during the process. Assessment team checked all the values of the electricity exported and electricity imported from the Meter reading statement issued by State electricity board. The electricity meters are under the custody of the DISCOM and calibrated by DISCOM as per their standard procedures. The electricity supplied by the project activity will be measured using electricity meter (3 phase 4 wire meter and of an accuracy of 0.2s) installed at the project site (switchyard/ site sub-station). The measurement also has a check meter installed and owned by the power purchaser. If during calibration, main meter is not within permissible ±0.2% error, then check meter will be used for the billing and monitoring. This form of measuring is in accordance with the best practices of the power industry in the host country. Measurement equipment – electricity meter (on 400 kV side at project switchyard). Measurement process – electronic logging of the hourly meter reading Calibration procedure – National Test House or equivalent – third party Testing accuracy of the measurement - ±0.2% Responsible person for measurement – recording by electrical operator, daily log sheet to be signed by supervisor Measurement interval – continuous monitoring and monthly record The monthly tariff invoices are being raised based on the UPERC Generation Tariff Regulations in force. Billing is being done for Capacity Charges based Declared Capacity and for Energy Charges based on Schedule Generation certified by the UPSLDC for that month i.e., billing cycle starts at 00.00 Hrs of 1st day of each month and ends at 24.00 Hrs on last day of the month. As per revised monitoring plan, Primary source for Net Electricity Supplied to Grid is JMR. DOE has checked the value of net electricity supplied to grid from JMR and found to be consistent. DOE has also checked Invoices for accuracy of data and

found that there is difference between electricity mentioned in JMR and Electricity mentioned in invoice[5]. This is due to the fact that Invoice is generated based on scheduled Energy at 0:00 Hrs of First day of month to 0:00 Hr of last day of month and with deductions of 12% Electricity based on JMR. The billing cycle of JMR will vary slightly by 1-2 days from invoice billing period. The deduction of 12% electricity of JMR is related to revenue realization and same is already considered in IRR calculations of the registered PDD. Hence, deduction of 12% of JMR Electricity in Invoice and difference of Electricity in JMR and Electricity in Invoice are as per norms of Uttar Pradesh State Electricity Load Dispatch Center (UPSLDC) and found to be acceptable.

As a conservative approach, Minimum of Net electricity supplied by the project activity to grid as per JMR (MWh) and Scheduled Energy (invoice Electricity +12% JMR electricity Value) after addition of 12% of JMR actual Energy (MWh) is considered for ER calculations. The Scheduled Energy i.e. No of units exported as per Monthly Energy Account issued by UPSLDC has been checked from Annexure B of Invoice and calculation of invoice KWh +12% JMR electricity matches with scheduled energy (i.e. No of units exported as per Monthly Energy Account issued by UPSLDC). ER sheet also added column for direct value of scheduled energy and values are consistent as per Annexure B of Invoice. This is as per revised PDD version 06 dated 30/10/2020 submitted along with PRC (Issuance Track). Thus the same is acceptable to the assessment team.

2. **Cap $_{PJ}$**: Installed capacity of the hydro power plant after the implementation of the project activity

As per the registered PDD, a third party-chartered engineer will monitor the project capacity annually with test as per the appropriate National Standard of testing. For the present monitoring period a third party CE certificate of Rajeev kumar Gupta, Chartered engineer (membership number:AM096725-7) for the year 2018 and 2019 confirm that the project capacity as mentioned in the registered PDD is implemented onsite. The project capacity has been tested as per standard procedure given by OEM/BHEL and does not vary from the design capacity. Further, the total installed capacity of the power plant is found to be 330 MW. There is no project design change envisaged for the present monitoring period. Moreover, assessment team during the remote audit checked the rated capacity of the generator from the name plate readings and found that the same is in line with the registered PDD.

3. **A**: Surface area of the poundage at the full volume

As per the registered PDD, the surface area of the pondage at full volume will be measured at project commissioning from a detailed topographical survey. For the present monitoring period a third party CE certificate of Rajeev kumar Gupta, Chartered engineer (membership number:AM096725-7) for the year 2018 and 2019 confirm that Reservoir area in surface of water after project implementation is 3,200,000 m^2. The value of surface area of the pondage at full volume is measured from project commissioning from a detailed topographical survey. The power density is therefore calculated as 103.125 W/m^2 (= 330000000W/3200,000m^2) which is greater than 10 W/m^2 and hence project emission for this part is zero.

4. **$FF_{i,y}$** : Quantity of fuel type i combusted in the back-up power plant (DG set)

[5] The monthly tariff invoices are being raised based on the UPERC Generation Tariff Regulations in force. Invoices are being done for Energy Charges based on Schedule Generation certified by the UPSLDC for that month. The Invoices are based upon the scheduled energy and after deducting 12% of JMR electricity as free energy for Govt of Uttarakhand. Therefore, Electricity as per Invoice should be added with 12% of actual JMR electricity to derive the scheduled energy (no of units exported as per Monthly Energy Account issued by UPSLDC). There is difference between Scheduled Energy and Actual JMR Energy. Finally Deviation Settlement Mechanism (DSM) statements settles out the difference between Scheduled and Actual Energy as per Electricity Board regulations. As a conservative approach, Minimum of Net electricity supplied by the project activity to grid as per JMR (MWh) and Scheduled Energy (invoice Electricity +12% JMR electricity Value) (MWh) is considered for ER calculations

	The diesel inventory records at the plant are used to calculate diesel consumption in DG set for backup power generation. The log sheets at plant side are checked during the remote audit and assessment team confirm that the value considered for project emission is correct. 5. **$NCV_{i,y}$** : Weighted average net calorific value of fuel type Diesel As per registered monitoring plan, The NCV will be obtained for each fuel delivery, from which weighted average annual values will be calculated, however fuel suppliers' Invoices do not mention calorific value, thus NCV is calculated based on CEA database and compared with IPCC default value with upper limit of uncertainty at 95% confidence level and higher value is considered for project emissions as a conservative approach. The same is acceptable to the assessment team. During the verification all relevant monitoring parameters (as listed in section B.7.1 of registered PDD) have been verified with regard to the appropriateness of the applied measurement / determination method, the correctness of the values applied for ER calculation, the accuracy, and applied QA/QC measures. The Verification team identified that the correct emission factor is reported under the section D.2 of the monitoring report to apply the appropriately report the emission factor. Based on above assessment the verification team confirms that requisite parameters are monitored in line with registered monitoring plan. However, CAR 04 was raised to make availability of supporting documents for the all ex-post monitoring parameters. CAR was closed on submission of all documents mentioned in the CAR.

E.6.3. Implementation of sampling plan

Means of verification	The verification assessed whether the compliance of the sampling efforts and surveys with the registered sampling plan in accordance with the "Standard for sampling and surveys for CDM project activities and programme of activities" if PP had applied a sampling approach to determine data and parameters monitored.
Findings	There is no CAR/CL raised in this section.
Conclusion	PP did not apply sampling plan to determine data and parameters monitored during this monitoring period. The verification team has checked all the documents such as JMR (Monthly meter Readings)/ obligation schedules and injection schedule reports, invoice etc. and hence sampling plan was not required. The verification team hereby confirms that are checked all the documents.

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

Means of verification	The verification team determined whether the calibration of the measuring equipment that has an impact on the claimed emission reductions is conducted by the PP at a frequency specified in the registered monitoring plan
Findings	CAR 05 was raised during the verification process and closed successfully. Please refer Appendix 4 of this report for the detail closure of the CAR.
Conclusion	The metering arrangement is Secure Meter Limited: make and 0.2s accuracy class energy meters installed in all the 4-feeder line connected to sub-station. These meters record several parameters including electricity exported & imported. State utility officials to obtain the value of export and import are using these electricity meters and hence Net electricity supplied is calculated based on export, import values. The details of the Calibration are as follows:

Meter Location	Meter	Calibration Date	Due Date	Calibration Date	Due Date	Compliance
Alaknanda Muzzafarnagar	Main: APMB 1763 Class: 0.2s	02/11/2015	01/11/2016	21/10/2016	20/10/2017	No delay in calibration observed as annual frequency followed
	Check: APMB	02/11/2015	01/11/2016	21/10/2016	20/10/2017	

	1759 Class: 0.2s					
Vishnuprayag	Main: APMB 1764 Class: 0.2s	02/11/2015	01/11/2016	21/10/2016	20/10/2017	
	Check: APMB 1760 Class: 0.2s	02/11/2015	01/11/2016	21/10/2016	20/10/2017	
Srinagar CK1 End	Main: APMB 1766 Class: 0.2s	-	-	29/08/2016	28/08/2017	
	Check: APMB 1762 Class: 0.2s	-	-	29/08/2016	28/08/2017	
Srinagar CK2 End	Main: APMB 1765 Class: 0.2s	-	-	29/08/2016	28/08/2017	
	Check: APMB 1761 Class: 0.2s	-	-	29/08/2016	28/08/2017	

The Srinagar CK1End and Srinagar CK2 End substations was Commissioned and starts operation from 2015. Therefore, all meters are pre-calibrated for the period 2015-16. Hence calibration report is available from 29/08/2016 onwards.

Calibration of the meter is to be carried out annually as per registered CDM PDD. The assessment team has checked the submitted calibration reports and found that no delay is observed in the scheduled calibration. hence accepted by assessment team and values from JMR is used for baseline emission calculation for conservative estimation of ER.

The calibration is done by accredited Laboratory from National Accreditation Board for Testing and Calibration, Govt. of India (http://www.nablindia.org) to carry out calibration. Assessment team checked the same and found that the calibration is appropriate and correct as traceability is ensured.
However, CAR 05 was raised for updating details regarding monitoring meters and its calibration. CAR was closed on revision of the MR & document submission for this CAR.

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

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

Means of verification	The verification team assessed whether the data and calculations of GHG emission reductions achieved resulting from the registered CDM project activity. The verification team has checked whether calculations of baseline GHG emissions have been carried out in accordance with the formulae and methods described in the registered monitoring plan.
Findings	CAR 06 was raised during the verification process and closed successfully. Please refer Appendix 4 of this report for the detail closure of the CAR.
Conclusion	The baseline is the MWh produced by the project activity multiplied by an emission coefficient (measured in tonnes CO_2/MWh) calculated in a transparent and conservative manner as the weighted average emissions (in tonnes CO_2/MWh) as described in approved PDD. The baseline emissions for the monitoring period are calculated as follows: $BE_y = EG_{facility,y} \times EF_{electricity,y}$ Where,

	BE_y = Baseline Emissions due to displacement of electricity during the year y (in tons of CO_2). $EG_{facility,y}$ = net quantity of electricity exported to the grid by the project in year y (MWh) $EF_{electricity}$ = Emission Factor grid is the carbon grid emissions factor of the Northern (now a part of NEWNE) region grid. $BE_y = EG_{facility,y} \times EF_{electricity,y}$ $= 1,798,011.96 \times 0.8032$ $= 1,444,163\ tCO_2e$ (Rounded down) However, CAR 05 was raised for availability of emission reduction sheet to assessment team. CAR was closed on document submission for this CAR.

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

Means of verification	The verification team assessed whether the data and calculations of GHG emission reductions achieved resulting from the registered CDM project activity. The verification team has checked whether calculations of project GHG emissions have been carried out in accordance with the formulae and methods described in the registered monitoring plan.
Findings	There is no CAR/CL raised in this section.
Conclusion	**Emissions from water reservoirs of hydro power plants ($PE_{HP,y}$)** For green filed hydro power plant If the power density of the project activity (PD) is greater than 10 W/m^2: $PE_{HP,y} = 0$. As per the registered PDD, the surface area of the pondage at full volume will be measured at project commissioning from a detailed topographical survey. For the present monitoring period a third-party CE certificate of Rajeev kumar Gupta, Chartered engineer (membership number:AM096725-7) for the year 2018 and 2019 confirm that Reservoir area in surface of water after project implementation is 3,200,000 m^2. The value of surface area of the pondage at full volume is measured from project commissioning from a detailed topographical survey. The power density is therefore calculated as 103.125 W/m^2 (= 330000000W/3200,000m^2) which is greater than 10 W/m^2 and hence project emission for this part i.e. $PE_{HP,y}$ is zero. DG set on the site is used only as a back up to run the essential auxiliaries when the unit of power project is down. However, the same is considered under project emissions as per the following computation: $PE_{CO2,y} = FF_y \times COEF_{CO2}$ $PE_{CO2,y} = 43.48 \times 43.3*0.0726$ $PE_{CO2,y} = 144\ tCO_2e$ (Rounded up Value) where: FF_y is the quantity of fossil fuel type used in the project during the year y, in tones and $COEF_{CO2}$ is the CO_2 emission factor of the fossil fuel type in tCO_2/ton of fuel. $COEF_{CO2} = NCV_{FF} \times EF_{CO2}$ where NCV_{FF} Is the net calorific value (energy content) per mass or volume unit of a fossil fuel. EF_{CO2} Is the carbon emission factor per unit of energy of the fossil fuel Hence, Project emission is as below: $PE_y = PE_{FF,y} + PE_{HP,y}$ $PE_y = 144 + 0$ $PE_y = 144\ tCO_2e$ Where, PEy = Project emissions in year y (tCO2e)

	$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2) $PE_{HP,y}$ = Project emissions from reservoirs of hydro power plants in year y (tCO_2e)

E.8.3. Calculation of leakage GHG emissions

Means of verification	The verification team assessed whether the data and calculations of GHG emission reductions achieved resulting from the registered CDM project activity. 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 registered monitoring plan.
Findings	There is no CAR/CL raised in this section.
Conclusion	The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction, fuel handling (extraction, processing, and transport), and land inundation (for hydroelectric projects – see applicability conditions in the registered PDD). As per the methodology, the leakage need not be considered. Thus, leakage is not considered in the project activity.

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

Means of verification	The verification team assessed whether the data and calculations of GHG emission reductions achieved resulting from the registered CDM project activity. 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 registered monitoring plan.
Findings	There is no CAR/CL raised in this section.
Conclusion	Emission reductions in this monitoring period are: Total Baseline Emissions: 1,444,163 tCO_2e Total Project Emission: 144 tCO_2e Total Leakage: 0 Total Emission Reduction: Emission reduction calculation is done based on following formula, Emission reduction (ER_y) = Baseline Emission (BE_y) – Project Emission (PE_y) = 1,444,163 tCO_2 – 144 tCO_2 = 1,444,019 tCO_2e (Round down)

E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	The verification team has determined the emission reductions achieved during this monitoring period with the estimated value and reason for increase if any.
Findings	There is no CAR/CL raised in this section.
Conclusion	The Emission Reduction (ER) value in the monitoring period is 4%[6] lower[7] as compared to the value estimated in the registered CDM PDD. This variation is caused by variability in the environmental conditions, which is beyond the control of the project proponent.

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

Means of verification	The verification team has determined the emission reductions achieved during this

[6] Calculated based on actual number of operational days and annual estimated emission reductions 1,203,884 tCO_2e and estimated ER for this monitoring period as 1,510,627 tCO_2e.

[7] The crediting period of the project started from 15/03/2013 however since the commissioning of the project was delayed hence the JMR was issued from 01/06/2015 hence the comparison is being done based upon the actual number of days the project was operational during current monitoring period.

	monitoring period with the estimated value and reason for increase if any.
Findings	There is no CAR/CL raised in this section.
Conclusion	The estimated emissions reductions for this monitoring period are 1,510,627 however actual ER achieved are 1,444,019 tCO2e. The actual CER is 4% lower than the estimated value. The generation of electricity depends upon many other climatic conditions, which are not within the control of the project participant. The lower generation during the current verification period is due to uncertain natural conditions. Thus, assessment team accepts it.

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

Means of verification	The verification team has determined the CER achieved during first commitment period and second commitment period
Findings	There is no CAR/CL raised in this section.
Conclusion	1. GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012: 0 tCO_2e 2. GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards: 1,444,019 tCO_2e (Monitoring period starting from 15/03/2013) 3. GHG emission reductions or net GHG removals by sink reported from 1 January 2021 = 0 tCO_2e

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

Means of verification	Not applicable for the present monitoring period
Findings	Not applicable for the present monitoring period
Conclusion	Not applicable for the present monitoring period

E.10. Global stakeholder consultation

Means of verification	Not applicable for the present monitoring period
Findings	Not applicable for the present monitoring period
Conclusion	Not applicable for the present monitoring period

SECTION F. Internal quality control

As a final step for verification, the final documentation, including the verification report, has to undergo an internal quality control by the Technical Reviewer(s) to be approved.
Details of the Technical Reviewer(s) are provided within the verification report in Section B.2. and Appendix 2 for further references of knowledge and capability to conduct the quality checking.
After the Technical Review process, the final documentation may undergo a final quality checking process called Administrative Review, done by the Applus+ Certification's Project Manager and/or Technical Support.
For final approval, the final set of documents are prepared by the DOE's Technical Manager or its deputy and signed by the authorized signatory of the DOE.
In case any of the persons performing this final internal quality control approval process has acted as a part of the Assessment Team or Technical Review team, the approval can only be given by DOE's authorized personnel who are not part of those teams.
If the final set of documents has been satisfactorily approved, a Request for Issuance is submitted to the UNFCCC CDM EB along with the relevant documents.

SECTION G. Verification opinion

Applus+ Certification has been engaged by M/s Alaknanda Hydro Power Company Limited to perform the 1st periodical verification of the "Run-of-the-river Hydroelectric Power Project in Uttarakhand by Alaknanda Hydro Power Company Limited" (UNFCCC Ref. No. 4776).

The M/s Alaknanda Hydro Power Company Limited is 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 approved PDD version 6 dated 30/10/2020 and the applied methodology ACM0002. ver. 12.1.0

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. The verification can confirm that:

- the project is operated as planned and described in the project design document approved by the EB;
- the monitoring plan is as per the applied methodology;
- the monitoring in Monitoring Report is as per the PDD and the monitoring plan approved by the EB;
- the development and maintenance of records and reporting procedures are in accordance with the registered monitoring plan;
- the installed equipment being essential for generating emission reduction runs reliably;
- the monitoring system is in place and generates GHG emission reductions data;
- the GHG emission reductions are calculated without material misstatements.

In our opinion, the GHG emission reductions for "Run-of-the-river Hydroelectric Power Project in Uttarakhand by Alaknanda Hydro Power Company Limited" for the monitoring period 15/03/2013 to 31/08/2016; as reported in Monitoring Report, prepared on the basis of the project's Monitoring Plan are fairly stated.

Based on the information we have seen and evaluated, we confirm the following statement:

Reporting period:	From 15/03/2013 to 31/08/2016 (Inclusive of both days)
Verified emissions in the above reporting period:	
Leakage emissions	0 tCO_2 equivalents
Project emissions	144 tCO_2 equivalents
Baseline emissions	1,444,163 tCO_2 equivalents
Emission reductions	1,444,019 tCO_2 equivalents

SECTION H. Certification statement

Same as above

Appendix 1. Abbreviations

Abbreviations	Full texts
BM	**Build Margin**
CAR	Corrective Action Request
CER	Certified Emission Reduction(s)
CEA	Central Electricity Authority
CL	Clarification request
CM	Combined Margin
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
DR	Document Review
EF	Emission Factor
ER	Emission Reductions sheet
FAR	Forward Action Request
JMR	Joint Meter reading
UPSLDC	Uttar Pradesh State Electricity Load Dispatch Center
UPERC	Uttar Pradesh Electricity Regulatory Commission
UPPTCL	Uttar Pradesh Power Transmission Corporation Ltd
GHG	Greenhouse gas(es)
GWP	Global Warming potential
PP	Project Participant
PPA	Power purchase agreement

Appendix 2. Competence of team members and technical reviewers

1. **Dr. Atul Takarkhede**, counts with 11 years of experience in field of Environmental Auditing, consulting and accreditation. He is an Expert in ISO 9001-14001, CO_2/GHG Reporting, Carbon Foot Print, Energy, Water and Waste Management Reporting for organizations environmental performance. His professional portfolio is mainly related with carrying out EIA, conducting QA/QC of EIA Reports; Conducting Environmental/water Audits; NABET requirements appliance. Furthermore, he counts with solid experience on CDM-VCS-GS consultancy and auditing. He has Ph.D. (Environmental Science) from Institute of Science, RTM Nagpur University, Nagpur, and he has already published different technical reports related to environmental science. Currently he is associated with True Quality Certifications Private Limited and is empaneled with APPLUS certification to carry out GHG audit.

2. **Mr. Denny Xue** (Master's Degree in Environmental Engineering, Bachelor's Degree in Thermal 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 technical review with Applus+. Before he joined Applus+ LGAI, he has been working for Shanghai Chuanji Investment and Management which is a CDM consultancy company as a project manager for CDM project development.

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	NA	Commissioning certificates	Commissioning Certificates of the project activity	Project participant
2	NA	Contract of the project participant with the DOE	Contract document signed between PP and DOE	Project participant
3	NA	CDM VVS	CDM validation and verification standard for project activities, Version 02.0	UNFCCC
4	NA	Joint Meter Reading (JMR)	JMR reports for the project activity covering complete monitoring period	Project participant
5	NA	Invoices/ Obligation Reports	Invoices for the complete monitoring period raised by PP (hard copies verified in presence of PP & not retained by DOE being confidential)	Project participant
6	NA	MR version 01 MR version 02 (Final)	MR version 01 dated 10/04/2021 MR version 02 dated 24/06/2021	Project participant
7	NA	ER sheet version 01 ER sheet version 02	Version 01 dated 10/04/2021 Version 02 dated 23/06/2021	Project participant
8	NA	Break Down details of plant	Log book records onsite maintained by O&M contractor	Project participant
9	NA	Application of materiality	Guidelines for Application of materiality in verifications version 2.0	UNFCCC
10	NA	Registered documents of the project activity/PRC Repots	https://cdm.unfccc.int/Projects/DB/BVQI1304680909.79/view • Registered PDD v06 dated 30/10/2020 • Final Validation Report. INDIA-VAL/215.49/2011 by Bureau Veritas, Dated 02/03/2011 • PRC Validation Report, Version 02, 04/11/2020	UNFCCC website
11	NA	Approved methodology	ACM0002. ver. 12.1.0	UNFCCC
12	NA	Calibration certificates	Calibration certificates for the Main and Check meters	PP
13	NA	PPA	Copy of Power Purchase Agreement (PPA)	PP
14	NA	O&M	O&M contract for the project activity	PP
15	NA	Training record	Training records of the O&M personals.	PP

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

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

~~**FAR ID**~~	~~xx~~	~~**Section no.**~~		~~**Date:** DD/MM/YYYY~~
~~**Description of FAR**~~				
This is 1st periodic verification. No FAR is remaining from validation and previous verification.				
~~**Project participant response**~~				~~**Date:** DD/MM/YYYY~~
~~**Documentation provided by project participant**~~				
~~**DOE assessment**~~				~~**Date:** DD/MM/YYYY~~

Table 2. CL from this verification

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

Table 3. CAR from this verification

CAR ID	01	**Section no.**	E.1	**Date:** 17/06/2021
Description of CAR				
The Editorial comments and supporting document requirement are compiled in one CAR. The same is described below: 1. *PP is requested to reframe the language throughout the MR as the project is already implemented and contributing towards emission reduction. Corrective action sought.* 2. *Name of PP mentioned in the section A.3 of MR is not inline with the UNFCCC webpage. Corrective action sought.* 3. *Information on the implementation and actual operation in section B.1 of the MR of the project activity, including relevant dates (e.g., construction, commissioning, start of operation) is mentioned. However, supporting related to the same is also not submitted to the assessment team.* 4. *In accordance with the Project Standard Ver.02, Para 256(A), Project participant mentioned the details regarding the technologies used in the project activity but to verify the same, no such document (i.e. technical equipment's details, technical lifetime etc.) is provided to DOE team* 5. *MR consists of some unused space. Thus, corrective action sought for the proper formatting of report.*				
Project participant response				**Date:** 25/06/2021

1. *The language is reframed throughout the MR versión 2 of the Project activities.*

2. *Name of PP is corrected as per the registered PDD available in UNFCCC webpage.*

3. *Supporting document related to the Information on the implementation and actual operation (Implementation agreement between Alaknanda Hydro and Govt. of Uttarakhand and Govt. of Uttar Pradesh), construction date, commissioning date, start date of operation mentioned in section B.1 of the MR will be provided to DOE for assessment.*

4. *Technical specifications of turbines and generator both can be confirmed from the name plates attached with them on site. Also refer Section 2 of document provided by BHEL for detailed technical specifications. The pictures of name plates of turbine & generator along with document received from BHEL shall be provided to DOE for cross check.*

5. *Proper formatting is done in MR versión 2 and unused space is eliminated.*

Documentation provided by project participant

MR version 2
Technical specifications of turbine and generators
Implementation agreement
Commissioning certificate

DOE assessment | **Date:** 27/06/2021

1. In Revised MRv.02, Language has been reframed as the project activity is implemented and continuously contributing towards emission reduction. Hence accepted.
2. PP has rectified the title of PP is section A.3 of revised MR and found inline with the UNFCCC webpage. Hence accepted.
3. PP has submitted copies of commissioning certificate to the assessment team. During review of the same, revised MR has been found consistent with certificates. Thus accepted.
4. In order to verify specification of technologies used in the project activity, PP has submitted images of name plates of Turbine and generators along with document issued by OEM (BHEL). Assessment team found consistent with the revised MR. thus accepted.
5. Monitoring report v.02 has been found with correct formatting and no unused space is observed.

All above discrepancies has been resolved. Thus, **CAR01 is closed.**

CAR ID	02	**Section no.**	E.3	**Date:** 17/06/2021

Description of CAR

In accordance with the Project Standard Ver.02, Para 260, Project Participant should provide Operation Log book records to DOE Team in orders to verify that does any plant shutdown happen or affects the calculation of GHG emission reduction or net anthropogenic GHG removal. Moreover, the supporting document regarding the breakdown details are also not provided to the assessment team. Corrective action is sought in the respective section of the MR and supporting documents for further analysis

Project participant response | **Date:** 25/06/2021

During the current monitoring period i.e. from 15/03/2013 to 31/08/2016, the plant underwent continued operation except scheduled breakdowns & thus resulted in emission reductions of 1,444,019 tCO2e. The plant underwent continued operation and no major breakdown happened during current monitoring period.

Documentation provided by project participant

Revised MR v.02

DOE assessment | **Date:** 27/06/2021

The project activity is in continuous operation and undergone scheduled maintenance and operation for the concerned monitoring period. No unforeseen incident observed during the monitoring period, which can affect the applicability or additionality of the methodology. Assessment team checked and confirm from the plant breakdown log sheets apart from scheduled maintenance (as per manufacturer specification) no any forced incident occurred which can alter the applicability of the methodology.

CAR02 is closed

CAR ID	03	**Section no.**	E.6.1	**Date:** 17/06/2021
Description of CAR				
In section D.1 of MR, Value for the Ex-ante parameter "Operating margin emission factor" is 1.0084. However, the same is not in line with the registered PDD.				
Project participant response				**Date:**25/06/2021
The value of parameter "Operating margin emission factor" has corrected in MR in line with the registered PDD.				
Documentation provided by project participant				
MR versión 2				
DOE assessment				**Date:** 27/06/2021
Assessment team found Section D.1 of revised MR has been rectified and PP has correctly mentioned 1.0086 (as per the registered PDD) as the value for Ex-ante parameter "Operating margin emission factor". Thus, accepted and **CAR03 is closed.**				

CAR ID	04	**Section no.**	E.6.2	**Date:** 17/06/2021
Description of CAR				
Following discrepancies are observed for the monitoring plan: *1. As per the registered PDD, the log book record (JMRs) for the parameter "EGfacility,y" is not submitted to the assessment team. Moreover, the invoices for cross check purpose are not submitted to the assessment team. Parameter is thus reserved. Moreover, the net dispatch can be cross checked with the document of electricity supply (sale to UPPCL and free unit to State of Uttarakhand). The same document is also not submitted to the assessment team.* *2. As per the registered PDD, installed capacity of hydro power plant: Source: The project capacity will be monitored annually by a 3rd party Chartered engineer (yearly) with test as per National standard of testing. The electrical head will ensure that the monitoring is done. The document is not submitted and hence parameter is reserved.* *3. As per the registered PDD, Surface area of the poundage for full volume: The surface area measurement will be done by 3rd party Chartered engineer (yearly). The surface area at full volume will be measured at project commissioning from a detail topographical survey. The civil head will ensure that the monitoring is done. The document is not submitted and hence parameter is reserved.* *4. The quantity of fuel combusted in back up power plant (D.G set): The log book records /diesel inventory records at the will be used. Cross check with purchase records is carried out. The documents are missing and hence parameter is reserved.* *5. Weighted Average Net calorific value: Value provided by the fuel supplier in the invoice. The documents are missing and hence Parameter is reserved. Moreover, Source of data mentioned in the MR is not in line with the registered PDD.*				
Project participant response				***Date:*** *25/06/2021*

1. The JMRs & electricity supply invoice for cross check of generation is being provided to DOE for this monitoring period. The net dispatch can also be cross checked from Invoices *2. The 3rd party Chartered engineer certificate is being provided to DOE for this monitoring period.* *3. The 3rd party Chartered engineer certificate is being provided to DOE for this monitoring period which also includes confirmation from civil head regarding "Surface area of the poundage for full volume".* *4. The Purchase records of diesel can be cross checked from Invoices raised by Bharat Petroleum Corporation Ltd. Same shall be shared with DVR responses.* *5. As per registered monitoring plan, The NCV is being obtained for each fuel delivery, from which weighted average annual values are being calculated, however fuel suppliers' Invoices do not mention calorific value, thus NCV is calculated based on CEA database and compared with IPCC default value with upper limit of uncertainty at 95% confidence level and higher value is considered for project emissions as a conservative approach.*
Documentation provided by project participant
JMRs *Invoices for Power* *Chartered engineer certificate* *Invoices for Diesel*
DOE assessment **Date:** 27/06/2021
1. Copies of JMRs and invoices has been received from Project participant and both documents found consistent with ER sheet. Thus accepted. 2. PP has submitted a third-party audit report on project activity issued by Mr. Rajeev Kumar Gupta, Chartered Engineer (Membership No. AM096725-7) dated 08/10/2015. As per the report, Project having four units of 82.5 MW Francis turbine (total Capacity = 330MW). Same is found consistent and acceptable as per the requirement of the registered PDD. 3. 3rd party Chartered engineer (yearly) with test as per National standard of testing is submitted to the assessment team for Surface area of the poundage for full volume. The same is acceptable and as per the requirement of the registered PDD. 4. The diesel log book records are submitted to the assessment team. The Project emission calculation is therefore found correct. 5. The NCV values has been taken from IPCC 2006 values and the same is found to be conservative value as NCV is not mentioned in the fuel supplier invoices and the same is found to be appropriate as per the monitoring plan of registered PDD. **CAR04 is closed.**

CAR ID	05	**Section no.**	E.7	**Date:** 17/06/2021
Description of CAR				
The calibration details are not provided in the MR. Moreover, Calibration certificates for the complete monitoring period are also missing. As Actual ER sheet is not submitted the delayed calibrated period cannot be confirmed. Corrective action is sought for the same.				
Project participant response				**Date:** 25/06/2021
The calibration schedule is updated in Annexure 1 of MR versión 2. Calibration certificates along with Actual ER sheet is being provided to DOE for reference.				
Documentation provided by project participant				
Calibration certificates for this monitoring period *Actual ER sheet*				
DOE assessment				**Date:** 27/06/2021
PP has mentioned about Calibration of monitoring meters in Appendix 1 of revised MR. Moreover, to verify the same Copies of calibration certificates also submitted. Assessment team reviewed the certificates and observed that project's meters are installed in 4-feeder line connected to sub-station and having no delay in calibration throughout the monitoring period. Thus, accepted and **CAR 05 is closed.**				

CAR ID	06	**Section no.**	E.8.1	**Date:** 17/06/2021
Description of CAR				

Following are the observations on the ER sheet: *1. ER sheet is not submitted to the assessment team and hence the ER value is thus reserved. PP requested to submit ER sheet with the cross-check mechanism as per the requirement of Methodology/PDD.* *2. Formula used to calculate Baseline emission or baseline net removal is not in line with the registered PDD, Corrective action is sought* *3. Formula used to calculate project emission is not in line with the registered PDD, Corrective action is sought.* *4. The billing period and monitoring period mismatch procedure is not detailed out in the MR. Corrective action is sought.* *The ER value is not rounded down which is not conservative. Corrective action is sought.* *The emission reduction calculation is thus reserved till the submission of proper documents*
Project participant response **Date:** 25/06/2021
1. ER sheet for this monitoring period with cross-check mechanism is being submitted to DOE with DVR responses. *2. In PDD, Baseline emission is calculated as BEy = EGy x EFelectricity,y . In the same way, Baseline Emission is calculated in MR Version 02.* *3. In PDD section B.6.3, it is mentioned that the project activity power plant will use DG sets for back up electricity requirement and this fossil fuel consumption will be accounted to calculate project emission as below in line with the 'Tool to calculate project or leakage CO2 emissions from fossil fuel combustion' Ver. 02, Equation No. 1. PEy = FFdiesel,y x NCVdiesel,y x EFdiesel,CO2. Using same formula Project emission is calculated in MR Version 02.* *4. In case of mismatch between billing period and monitoring period, the net electricity generated is being calculated based upon the generation ratio for the number of days covered during the monitoring period. Same is mentioned in Section D.2 Data and parameters monitored of MR version 2 for reference.*
Documentation provided by project participant
ER sheet *MR versión 2*
DOE assessment **Date:** 27/06/2021
1. PP has submitted ER sheet to the assessment team. Achieved emission reduction is found conservative and correct. 2. In Revised MR, Formula used to calculate Baseline emission has been found inline with the registered PDD. 3. In Revised MR, Formula used to calculate project emission is found inline with the applied tool and as per registered PDD. thus accepted. 4. The discrepancy has been resolved in revised MR. Moreover, Calculated emission reduction is round-downed too. Above all revision has been accepted and **CAR06 is closed.**

Table 4. FAR from this verification

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

Document information

Version	*Date*	*Description*
04.0	6 April 2021	Revision to: • Reflect the "Clarification: Regulatory requirements under temporary measures for post-2020 cases" (CDM-EB109-A01-CLAR).
03.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM validation and verification standard for project activities" (CDM-EB93-A05-STAN); • Make structural and editorial improvements.
02.1	11 January 2018	Editorial revision to correct the numbering of appendices in the instructions.
02.0	31 October 2017	Revision to align with the requirements of the "CDM validation and verification standard for project activities" (version 01.0).
01.0	23 March 2015	Initial publication.

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