GRID CONNECTED ELECTRICITY GENERATION FROM RENEWABLE SOURCES: UZUNCAYIR 82.0 MW HYDROELECTRIC POWER PLANT PROJECT, TURKEY

Document Prepared By: 4K Earth Science Private Limited

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Summary:

4K Earth Science Private Limited (4KES) has been contracted by, "Ekobil Environmental Services and Consultancy Ltd.[1]" to undertake verification and certification for the greenhouse gas (GHG) emission reductions reported from 'Grid connected electricity generation from renewable sources: Uzuncayir 82.0 MW Hydroelectric Power Plant Project, Turkey' for the monitoring period 02/12/2019 to 31/12/2021 in the initial monitoring report version 1.0 date 18/02/2022.

Uzuncayir HEPP is located on Munzur river and it is 18 km away from Tunceli city center. Uzuncayir HEPP consists of 3 units, each having an installed capacity of 27.33 MWe/28 MWm. Total installed capacity of the project is 82 MWe/84 MWm[2]. The first unit of the project was started to produce electricity on 02/12/2009. After that, the second unit was commenced on 28/01/2010 and last, the project was commenced with full capacity on 12/04/2010, after the commissioning of the last unit. During this monitoring period (02/12/2019 to 31/12/2021, both days inclusive), the project has produced a net total of 426,504.26 MWh electricity and a total amount of 171,708 tCO_{2e} of emission reduction. The monitoring period subject to this monitoring report is inclusive of first and last day of period.

A risk-based approach has been followed to perform the 1st periodic verification of the project activity of 2nd crediting period. In the course of the verification, 04 Corrective Action Requests (CARs) and 01 Clarifications (CLs) were raised.

The management of the 'Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi' responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions on the basis set out within the project final monitoring report Version 1.1 dated 01/09/2022. The calculation and determination of GHG emission reductions from the project is the responsibility of the management of the Ekobil Environmental Services and Consulting Ltd. The development and maintenance of records and reporting procedures are in accordance with the Monitoring Report Version 1.1 dated 01/09/2022.

It is our responsibility to express an independent GHG verification opinion on the GHG emissions and on the calculation of GHG emission reductions from the project for the period 02/12/2019 to 31/12/2021 based on the reported emission reductions in the final monitoring report Version 1.1 dated 01/09/2022 for the same period.

[1] It is Ekobil Environmental Services and Consultancy Ltd. that contracted 4KES authorised by the project owner. Ekobil is responsible for writing the Monitoring report and the contracting of the VVB.

[2] e refer to electrical and m refer to mechanical.

Based on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these, 4KES planned and performed our work to obtain the information and explanations that we considered necessary to provide sufficient evidence for us to give reasonable assurance that this reported amount of GHG emission reductions for the period is fairly stated.

4KES confirms the following;
Reporting period: 02/12/2019 to 31/12/2021

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2019	4,881	901	0	3,980
2020	127,442	23,318	0	104,124
2021	77,899	14,295	0	63,604
Total	**210,222**	**38,514**	**0**	**171,708**

1 INTRODUCTION

1.1 Objective

4KES has been commissioned by 'Ekobil Environmental Services and Consultancy Ltd.' to perform verification of its registered VCS project 'Grid connected electricity generation from renewable sources: Uzuncayir 82.0 MW Hydroelectric Power Plant Project, Turkey' VCS 762, for the reported GHG emission reductions for the given monitoring period 02/12/2019 to 31/12/2021 (both dates included). The VCS projects must undergo an independent third-party verification and certification of emission reductions as the basis for issuance of Voluntary Emission Reductions (VERs).

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

- The project activity has been implemented and operated as per the project description (PD) and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;
- Monitoring report and other supporting documents are complete;
- The data is recorded and stored as per the monitoring methodology and approved monitoring plan.
- To confirm that the monitoring system is implemented and fully functional to generate Voluntary Emission Reductions (VERs/VCUs) without any double counting, and
- To establish that the data reported are accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation.

1.2 Scope and Criteria

The scope of verification is to assess the claims and assumptions made in the VCS monitoring report (MR) against the VCS criteria, including but not limited to, VCS standard, applied methodology and other relevant rules and requirements established for VCS project activities.

The Verification is not meant to provide any consulting towards the project participants. However, stated requests for clarification and/or correction actions request may have provided inputs for improvement of the project design.

1.3 Level of Assurance

The verification team verified the complete monitoring data /11/, /12/, /15/, /16/, /17/ and /19/ for all the monitoring parameters of the monitoring plan against the Monitoring report /1.2/ and ER Calculation sheet /2.2/ and confirms that the reported emission reductions are free from any type of material errors. Remote audit by TL and physical site visit by LE was also conducted to verify the implementation and monitoring plan of the project activity. The implementation of the project activity (i.e. major equipment and the metering arrangement) was verified during the Zoom video conferencing//Physical site visit and found in accordance with the monitoring report /1.2/ and registered VCS PD /04/. Verification team has also verified the technical details of the project equipments and metering arrangement with the supportive documents /10/, /11/, /13/ and found correct. Therefore, 4KES confirms that the verification is conducted with reasonable level of assurance.

1.4 Summary Description of the Project

Uzuncayir HEPP is located on Munzur river and it is 18 km away from Tunceli city center. Uzuncayir HEPP consists of 3 units, each having an installed capacity of 27.33 MWe/28 MWm and total installed capacity of the project is 82 MWe/84 MWm. The total capacity of project capacity is verified from the remote audit/Physical site visit, commissioning certificate /07/, technical specifications /10/, photos /11/ and production license /14/.

The first unit of the project was started to produce electricity on 02/12/2009. After that, the second unit was commenced on 28/01/2010 and last, the project was commenced with full capacity on 12/04/2010, after the commissioning of the last unit. The commissioning date of each unit has been verified from commissioning certificates /07/. All the units were commissioned before this monitoring period.

The chosen monitoring period i.e. 02/12/2019 to 31/12/2021 is within the 2nd crediting period i.e. 02/12/2019 to 01/12/2029 which is accepted to the verification team.

Uzuncayir HPP is located on Munzur river and it is 18 km away from Tunceli city center. The project is located in the Eastern Anatolia Region of Turkey, within the province of Tunceli. The project is located between the latitudes 39° 06”-39° 58”and longitudes 39° 28”-39° 36”.

Verification team has verified the latitude and longitude thought internet https://www.latlong.net/ and found consistent.

During the current monitoring period which started form 02/12/2019 to 31/12/2021 (inclusive of both i.e. first and last day), the project activity has supplied 426,504.26 MWh of electricity to the grid, thereby resulted in an emission reduction of 171,708 tCO_2e.

2 VERIFICATION PROCESS

The registered VCS project is undergoing first verification under VCS (2nd Crediting period), the approach adopted to ensure the quality of emission reductions is described in the following sections.

2.1 Method and Criteria

4KES assessed and determined whether the proposed implementation and operation of the project activity, and the steps taken to report emission reductions comply with the criteria and relevant guidance provided by the VCS Board. The validation/verification process consist of the following three phases;

- A desk review of the VCS PD and VCS MR
- follow up interviews with project stakeholders
- The resolution of outstanding issues and issuance of final report and opinion.

The prepared verification report and other supporting documents then undergo an internal quality control before being submitted to the Verra Secretariat for issuance of credits as per VCS standard version 4.3.

Duration of Verification:

Verification Contract	03/08/2022
Remote audit	10/08/2022 (Zoom remote audit by Team leader and Physical site visit by Local Expert)
Findings raised	15/08/2022
Draft Verification Report	07/09/2022
Final Verification Report	10/09/2022

2.2 Document Review

The verification is performed primarily as a document review of the approved VCS PD and associated documents as stated in detail in appendix 1 of this document. The assessment is performed by a verification team using a protocol. The cross checks between information provided in the Monitoring report, VCS PD and information from sources other than those used, if available, the team's sectoral or local expertise and, if necessary, independent background investigations.

2.3 Interviews

Verification team performed the Zoom remote audit/Physical site visit and interviewed PP, site person, consultant and local stakeholders and reviewed documents to achieve a reasonable

level of assurance in the verification. This is in line with Section 4.1.2 of the VCS Standard, v4.3 which does not explicitly mandate site visits as part of the validation and verification process, only that VVBs must achieve a reasonable level of assurance on all validations and verifications. No sampling procedures were adopted in document verification and all the document were cross checked to ensure conservative estimation of emission reduction. Kindly find below names of the persons interviewed (Zoom remote interview/Physical site visit).

Location	Uzuncayir HPP is located on Munzur river and it is 18 km away from Tunceli city center. The project is located in the Eastern Anatolia Region of Turkey, within the province of Tunceli.	
Dates	10/08/2022 (PP, Site person, Consultant and Local Stakeholders)	
Key points discussed	**Name of person, interviewed**	**Designation, Organization**
Implementation, Monitoring, Operational data, Calibration, Data collection, QA/QC procedures, Calculation of ERs, VCS requirements	Mr. Fatih Baydar	Trading Manager, Limak Energy Trade
	Mr. Mahmut Küçük	Site Manager, Limak Holding
	Dr. G.Aslı Sezer Özçelik	Team Leader, Ekobil Environmental Services and Consultancy Ltd. (Project Consultant)
	Ms. Zeynep Artaç	Project Consultant, Ekobil Environmental Services and Consultancy Ltd.
	Ms. Aysenaz Toptas	Project Consultant, Ekobil Environmental Services and Consultancy Ltd.
Sustainable development Impact, Complaints, Mode of communication, Environmental impact, any other concerns	Kenan Özer	Local People, Kanoğlu Village, Turkey
	Volkan Alan	Local People, Burmegeçit Village, Turkey
	Murat Tekin	Local People, Burmegeçit Village, Turkey
	ÇAĞLAR ÇETİNKAYA	Local People, Burmegeçit Village, Turkey
	Bülent Çakmak	Local People, Burmegeçit Village, Turkey

2.4 Site Inspections

*V*erification team performed the Zoom remote *audit/Physical site visit and interviewed* PP, site person, consultant and local stakeholders and reviewed documents to achieve a reasonable level of assurance in the verification. This is in line with Section 4.1.2 of the VCS Standard, v4.*3* which does not explicitly mandate site visits as part of the validation and verification process, only that VVBs must achieve a reasonable level of assurance on all validations and verifications.

2.5 Resolution of Findings

The objective of this step is to identify, discuss and conclude on the issues related to the monitoring, implementation and operations of the registered project activity that could impair the capacity of the registered project activity to achieve emission reductions or influence the monitoring and reporting of emission reductions. This is done based on the desk review and Zoom remote interview/Physical site visit. The verification team prepares and/or updates a verification protocol (internal document) that records the conformities and non-conformities, which may be of following types;

CAR (Corrective Action Request) is raised if one of the following occurs:

- Non-compliance with the monitoring plan, the methodology or the standardized baseline are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;
- Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants;
- Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions;
- Issues identified in a FAR during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.

Clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. All CARs and CLs raised by the 4KES during verification shall be resolved prior to submitting a request for issuance.

FAR (Forward Action Request) is raised during verification if the monitoring and reporting require attention and/or adjustment for the next verification period.

During the Verification process, total 04 CAR and 01 CL were raised and resolved satisfactorily. No FAR has been raised in the verification. The list of CARs/CLs/FARs raised and the response provided, the mean of validation, reasons for their closure and references to correction in the relevant documents are provided in Appendix II of this report.

2.5.1 Forward Action Requests

No FAR raised during the verification.

2.6 Eligibility for Validation Activities

4KES conducted the verification activity; the validation was performed by the other VVB. 4KES has a valid UNFCCC accreditation in the sectoral scope from UNFCCC. The accreditation scope can be checked from the below link: http://cdm.unfccc.int/DOE/list/DOE.html?entityCode=E-0069

3 VALIDATION FINDINGS

Use this section to provide details of all validation activities that took place during the verification, such as gap validation, validation of methodology deviations and project description deviations, and the inclusion of new project activity instances into grouped projects.

3.1 Participation under Other GHG Programs

The project is registered in VCS only, verification team confirms that it has checked that there is no double counting associated with project activity being participation of other GHG programs.

3.2 Methodology Deviations

Deviation: The electricity is invoiced according to the complex MFRC rules and the sold amount is not indicated on the invoice. Therefore it is not possible to use the invoices for QA/QC purpose to compare the electricity generation amount. This amount can be traced, however over the PMUM/MFRC system where the project owner has an access via a specific user ID and Password. The amount of electricity supplied to the grid by the project activity can be observed and cross checked via screenshots of PMUM/MFRC system.

Justification: The data has been verified from the TEIAS and EPIAS web portals which are government portals /17/ and hence accepted to the verification team. The data is available online which can be verified. Verification team has verified all the data and hence the deviation does not reduce the accuracy and completeness of the monitoring plan. The methodology deviation do not negatively impact the conservativeness of the GHG emission reductions or removals quantification. The deviation only relates to procedures for monitoring or measurement. Hence it is accepted to the verification team.

3.3 Project Description Deviations

Deviation: The following are the minor deviations from the monitoring plan: The electricity is measured by 3 sets of meters, each set is made up of one main meter and one control meter. And each set measures the electricity generated by one of the three turbines of the Uzuncayır HEPP. The calibration of the meters are checked remotely by TEIAŞ by comparing the control meter readings to the main meter readings. Therefore control meter readings are not recorded and used in the QA/QC procedures. The second monitoring period is longer than initially planned in the Validated PD and it is longer than 12 months. The emission reductions calculation excel sheet, that was presented as a supplement in the validated PDD, is not used for calculations as it was not taking into account the project emissions.

Justification: The above mentioned deviations are minor deviations which does not have any impact on the methodology criteria and do not reduce the accuracy and completeness of the monitoring plan. The monitoring is done as per the methodology requirements and the calculation of the emission reduction is done as per the monitoring plan and the applied methodology i.e. ACM 0002 Version 20.0. Further the project description deviations do not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario. Hence the deviation is accepted to the validation team.

3.4 Grouped Project

The project is not a grouped project. Therefore, this section is not applicable.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

Uzuncayir HEPP is located on Munzur river and it is 18 km away from Tunceli city center. Uzuncayir HEPP consists of 3 units, each having an installed capacity of 27.33 MWe/28 MWm and total installed capacity of the project is 82 MWe/84 MWm. The total capacity of project capacity is verified from the remote audit/physical site visit, commissioning certificate /07/, technical specifications /10/, photos /11/ and production license /14/.

The technical details of the turbine and generator were confirmed from the technical specifications /10/ and during Zoom remote audit/Physical site visit.

The first unit of the project was started to produce electricity on 02/12/2009. After that, the second unit was commenced on 28/01/2010 and last, the project was commenced with full capacity on 12/04/2010, after the commissioning of the last unit. The commissioning date of

each unit has been verified from commissioning certificates /07/. All the units were commissioned before this monitoring period.

During the process of verification, 4KES confirmed the capacity, unique identification of the project activity, estimated power generation, arrangement for evacuation of electricity generated, technical specifications, date of commissioning, arrangements for Operation & Maintenance (O&M) and necessary clearances for setting the project activity. List of documents reviewed during the course of verification is presented under Appendix I of this report.

There was no major breakdown or shutdowns during the monitoring period which might affect the applicability of methodology or might cause material errors in emission reductions.

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 & monitoring report submitted 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 & monitoring report are available and implemented in an appropriate manner.

The organisational role and responsibility as mentioned in the registered VCS PD & monitoring report is followed onsite. All the monitoring equipment was calibrated as per the specified interval in the registered VCS PD & monitoring report. All the emergency preparedness as mentioned in the registered VCS PD & monitoring report is followed onsite and no discrepancies were found regarding the same.

Project activity provide local jobs and contributing to the improvement of infrastructure in the region. Section 1.11 of the Monitoring report has been checked and found OK. The project activity contributes positively to sustainable development which has been verified from the interview of the Local people (Section 2.3 of this report) and supportive documents /06/. Local stakeholders were happy with the project and shared positive feedback about the job creation and other sustainable development.

The assessment team found that the project is in line with the registered VCS PD, monitoring report.

Opinion:

Assessment team concludes the following:

a) There is no material discrepancies between project implementation and the project description provided in the registered PD/04/.

b) The monitoring plan is implemented completely and monitoring system (i.e., process and schedule for obtaining, recording, compiling and analysing the monitored data and parameters) is appropriate.

c) There is no material discrepancies between the actual monitoring system and the monitoring plan set out in the project description and the applied methodology.

d) The GHG emission reductions or removals generated by the project have not included in an emissions trading program or any other mechanism that includes GHG allowance trading.

e) The project has not received or sought any other form of environmental credit, or has become eligible to do so since validation or previous verification.

f) The project is registered under VCS only.

In view of the information's as verified above the assessment team is able to conclude that the project has been implemented as described in the project description.

4.2 Safeguards

4.2.1 No Net Harm

In the validated VCS-PDD, the positive impact of the project to the social, economical and environmental situation is mentioned as: "...to support energy security, improved air quality, alternative sustainable energy, improved local source of income and sustainable renewable energy industry development. The specific benefits of the project are:

- Reducing greenhouse gas emissions in Turkey compared to the business-as-usual scenario,
- Helping stimulate private sector participation in hydro power industry in Turkey,
- Creating employment during the construction and the operation phase of the plant,
- Helping to reduce some other pollutants from power generation industry in Turkey, compared to a business-as-usual scenario,
- Helping to diminish Turkey's increasing energy deficit,
- Diversify the electricity generation portfolio and reduce dependency on import of other energy sources."

Verification team has interviewed various local stakeholders and found no harm to air, water, noise etc. Local stakeholders were happy with the project and shared positive feedback about the job creation and other sustainable development. Hence verification team confirms that there are no any significant impacts due to implementation of project activity on air, water, Solid Waste, Waste Oils Hazardous Waste, Noise etc.

4.2.2 Local Stakeholder Consultation

Since Limak did not undertake the construction of the project, the company did not hold an official stakeholder in participation meeting. However, the project managers had been open to face to face communications with local people in order to solve any problem that the project had caused in the construction phase and the process was validated during the registration of project activity in VCS. VCS validation report verified to confirm the same.

The ongoing communication is undertaken through stakeholder visits to the site or direct contact via telephone. Verification team has interviewed various local stakeholders and confirm that no negative comments about the project have been received. Stakeholders tend to focus on the positive sides of the project such as creation of employment, the touristic activities around the artificial lake, new facilities, sport activities etc. Stakeholders can directly visit or call the power plant when they have a problem. Since the project started, the project owners have not received any negative comments.

4.3 AFOLU-Specific Safeguards

Not Applicable.

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology ACM 0002 (version 20.0), the formulae given in the monitoring report version and also based on the validation opinion stated in the VCS validation report /05/.

Parameter monitored:

4.4.1 $EG_{PP-net,\ y}$ (MWh)

Quantity of the net electricity supplied to the grid by the power plant in year y.

	Discussion and verification assessment
Purpose of data	Data is used to calculate baseline emission.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	This parameter is calculated by subtracting the electricity export ($EG_{PP-export,y}$) and electricity import ($EG_{PP-import,y}$). The primary source of data is the Main TEIAS meters located at the Project Powerhouse. There are bidirectional meters. The meters belong to the grid operator TEIAŞ. The electricity data is continuously measured by the energy meters. The data read through these meters are recorded hourly basis by project operator (Manual recording) and monthly by TEIAS. There are three main meters, each record the generation/import of electricity from each line that transmit the electricity generated by each unit of generators, and there are three back-up meters, for each one of these main meters. The details of the energy meters is mentioned under section 4.2 and section 4.3 of the monitoring report /1.2/. The accuracy class of the energy meters is 0.5. The details of the energy meters used for this monitoring period is given below. **Meter type**: EMH-LZQJ-XC **Accuracy class**: 0.5 S **Calibration valid from**: 30/11/2019 to 30/11/2029 8923709-Measures generation by turbine I(main)

	8923710-Measures generation by turbine I(control) 8923711- Measures generation by turbine II(main) 8923712- Measures generation by turbine II(control) 8923713- Measures generation by turbine III (main) 8923714- Measures generation by turbine III(control) Verification team has checked the meter details during the remote interview/physical site visit and found OK. The meters need to be calibrated every 10 years as per the government regulation /18/. The calibration was covering the monitoring period.
Measuring/Reading/ Recording frequency	For all the meters involved, measurement is made continuous and recording is made monthly as verified from the monthly electricity data /17/ and remote zoom audit/physical site visit. All the meters belong to grid operator TEIAS.
Data collection (from data generation, aggregation, to recording, calculation and reporting)	The generation/import is measured every month using energy meters. This parameter is calculated by subtracting the electricity export ($EG_{PP-export,y}$) and electricity import ($EG_{PP-import,y}$). Entity responsible: Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi
Verified value	426,504.26 MWh. The data has been verified from the TEIAS and EPIAS web portals which are government portals /17/ and hence accepted to the verification team. The data is available online which can be verified.
Cross checks	NA
QA/QC procedures applied	The energy meters are calibrated as per the government regulation which has been confirmed during the remote audit and the calibration records /16/.

4.4.2 $EG_{PP-export,y}$ (MWh)

Quantity of electricity exported by the power plant to the grid in year y.

	Discussion and verification assessment
Purpose of data	Data is used to calculate net electricity supplied to the grid.
Monitoring equipment (type,	The primary source of data is the Main TEIAS meters located at the

accuracy class, serial number, calibration frequency, date of last calibration, validity)	Project Powerhouse. There are bidirectional meters. The meters belong to the grid operator TEIAŞ. The electricity data is continuously measured by the energy meters. The data read through these meters are recorded hourly basis by project operator (Manual recording) and monthly by TEIAS. There are three main meters, each record the generation/import of electricity from each line that transmit the electricity generated by each unit of generators, and there are three back-up meters, for each one of these main meters. The details of the energy meters is mentioned under section 4.2 and section 4.3 of the monitoring report /1.2/. The accuracy class of the energy meters is 0.5. The details of the energy meters used for this monitoring period is given below. **Meter type**: EMH-LZQJ-XC **Accuracy class**: 0.5 S **Calibration valid from**: 30/11/2019 to 30/11/2029 8923709-Measures generation by turbine I(main) 8923710-Measures generation by turbine I(control) 8923711- Measures generation by turbine II(main) 8923712- Measures generation by turbine II(control) 8923713- Measures generation by turbine III (main) 8923714- Measures generation by turbine III(control) Verification team has checked the meter details during the remote interview/physical site visit and found OK. The meters need to be calibrated every 10 years as per the government regulation /18/. The calibration was covering the monitoring period.
Measuring/Reading/ Recording frequency	For all the meters involved, measurement is made continuous and recording is made monthly as verified from the monthly electricity data /17/ and remote zoom audit/physical site visit. All the meters belong to grid operator TEIAS.
Data collection (from data generation, aggregation, to recording,	The generation/import is measured every month using energy meters. Entity responsible: Limak Yatirim Enerji Uretim Isletme Hizmetleri ve

calculation and reporting)	Insaat Anonim Sirketi
Verified value	427,915,24 MWh. The data has been verified from the TEIAS and EPIAS web portals which are government portals /17/ and hence accepted to the verification team. The data is available online which can be verified.
Cross checks	NA
QA/QC procedures applied	The energy meters are calibrated as per the government regulation which has been confirmed during the remote audit and the calibration records /16/.

4.4.3 $EG_{PP\text{-}import,y}$ (MWh)

Quantity of electricity imported by the power plant from the grid, in year y.

	Discussion and verification assessment
Purpose of data	Data is used to calculate net electricity supplied to the grid.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	The primary source of data is the Main TEIAS meters located at the Project Powerhouse. There are bidirectional meters. The meters belong to the grid operator TEIAŞ. The electricity data is continuously measured by the energy meters. The data read through these meters are recorded hourly basis by project operator (Manual recording) and monthly by TEIAS. There are three main meters, each record the generation/import of electricity from each line that transmit the electricity generated by each unit of generators, and there are three back-up meters, for each one of these main meters. The details of the energy meters is mentioned under section 4.2 and section 4.3 of the monitoring report /1.2/. The accuracy class of the energy meters is 0.5. The details of the energy meters used for this monitoring period is given below. **Meter type**: EMH-LZQJ-XC **Accuracy class**: 0.5 S **Calibration valid from**: 30/11/2019 to 30/11/2029 8923709-Measures generation by turbine I(main)

	8923710-Measures generation by turbine I(control) 8923711- Measures generation by turbine II(main) 8923712- Measures generation by turbine II(control) 8923713- Measures generation by turbine III (main) 8923714- Measures generation by turbine III(control) Verification team has checked the meter details during the remote interview/physical site visit and found OK. The meters need to be calibrated every 10 years as per the government regulation /18/. The calibration was covering the monitoring period.
Measuring/Reading/ Recording frequency	For all the meters involved, measurement is made continuous and recording is made monthly as verified from the monthly electricity data /17/ and remote zoom audit/physical site visit. All the meters belong to grid operator TEIAS.
Data collection (from data generation, aggregation, to recording, calculation and reporting)	The generation/import is measured every month using energy meters. Entity responsible: Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi
Verified value	1,410.98 MWh. The data has been verified from the TEIAS and EPIAS web portals which are government portals /17/ and hence accepted to the verification team. The data is available online which can be verified.
Cross checks	NA
QA/QC procedures applied	The energy meters are calibrated as per the government regulation which has been confirmed during the remote audit and the calibration records /16/.

4.4.4 CapPJ (MW)

Installed capacity of the hydro power plant after the implementation of the project activity.

	Discussion and verification assessment
Purpose of data	To calculate power density
Monitoring equipment (type, accuracy class,	Not Applicable

serial number, calibration frequency, date of last calibration, validity)	
Measuring/Reading/ Recording frequency	Yearly
Data collection (from data generation, aggregation, to recording, calculation and reporting)	Observed via the SCADA system of the Project Activity or name plate of each generator unit /11/
Verified value	82 MW. The data has been verified from the name plate capacity during the remote audit/physical site visit /11/.
Cross checks	NA
QA/QC procedures applied	NA

4.4.5 APJ (m2)

Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.

	Discussion and verification assessment
Purpose of data	Power density calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Not applicable
Measuring/Reading/ Recording frequency	Indirectly measured based on depth readings from the SCADA system. Verification team has checked the calculation and found OK. This verified from the daily reports /19/ having water level, graph /15/ and from the scada screen during remote audit.

Data collection (from data generation, aggregation, to recording, calculation and reporting)	The reservoir area corresponding to maximum operational level has been determined as a certain value according to the topographical maps And a correlation graphic that exhibits the relationship between the water depth, reservoir area and the volume of the reservoir is plotted against a graphic.
Verified value	13,400,000 m^2. The data is found correct.
Cross checks	NA
QA/QC procedures applied	NA

Opinion: The verification team confirms;

- The monitoring plan has been implemented as per the registered PD;
- The monitoring complies with the requirement of the applied methodologies;
- The information inflow (from data generation, aggregation, to recording, calculation and reporting) is included above under each parameters and confirms to the requirement of the PDD;
- The values included in the monitoring report and corresponding emission reduction sheets are verified and included under each monitoring parameter, wherever appropriate;

Parameters not monitored/ex-ante:

4.4.6 $EF_{grid,OM,y}$ (tCO_2/MWh)

Operating margin CO2 emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system"

	Discussion and verification assessment
Purpose of data	Data used for the calculation of $EF_{grid,CM,y}$
Verified value	0.7258 Verified from registered PDD /04/.
Source of value	Validated ex-ante. Data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021[3]
Justification	Values are checked from registered PD /04/ and VCS validation

[3] https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

	report /05/.

4.4.7 $EF_{grid,BM,y}$ (tCO_2/MWh)

Building margin CO2 emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system"

	Discussion and verification assessment
Purpose of data	Data used for the calculation of $EF_{grid,CM,y}$
Verified value	0.4153 Verified from registered PDD /04/.
Source of value	Validated ex-ante. Data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021[4]
Justification	Values are checked from registered PD /04/ and VCS validation report /05/.

4.4.8 $EF_{grid,CM,y}$ (tCO_2/MWh)

Combined margin Emission Factor of Turkey

	Discussion and verification assessment
Purpose of data	Calculation of baseline emission (BE_y).
Verified value	0.4929 Verified from registered PDD /04/.
Source of value	Validated ex-ante. Data published by Turkish Ministry of Energy and Natural Resources on 06/10/2021[5]
Justification	Values are checked from registered PD /04/ and VCS validation report /05/.

Opinion:

In the opinion of assessment team, the assumptions, emission factors and default values that were applied in the calculations have been justified.

[4] https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

[5] https://enerji.enerji.gov.tr/Media/Dizin/BHIM/tr/Duyurular//Bilgi_Formu_Web_Sitesi_2019_202110071443.pdf

Assessment of Data and Calculation of GHG emission reductions:

According to the approved methodology ACM 0002 (Version 20.0) Emission Reductions are calculated as

ERy = BEy – PEy

Where:

ERy Emission reductions in year *y* (t CO2e)

BEy Baseline Emissions in year *y* (t CO2)

PEy Project Emissions in year *y* (t CO2e)

Baseline Emissions

Baseline emissions are determined using the formula:

$BE_y = EG_{PJ,y} \text{ X } EF_{grid,CM,y}$

Where:

BE_y Baseline emissions in year y (tCO2)

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

$EF_{grid,CM,y}$ Combined margin CO2 emissions factor in year y (tCO2/MWh)

And

$EG_{PJ,y} = EG_{Facility,y}$

$EG_{Facility,y}$ = Quantity of net electricity generation supplied by the project plant to the grid in year y (MWh/y)

The Combined margin CO_2 emissions factor in year y (tCO_2 /MWh), $EF_{grid,CM,y}$, is fixed ex-ante for the duration of the 2nd crediting period and is 0.4929 tCO2e /MWh. The electricity supplied to grid for this monitoring period is 426,504.26 MWh. Hence, baseline emission for this monitoring period is 210,222 tCO_2. Verification team has checked the baseline emission calculation from the ER sheet /2.2/ and found OK.

Project Emissions

The Project emissions are calculated with the formula mentioned in ACM0002 / Version 20 as:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Where:

$PE_{HP,y}$ = Emission from reservoir expressed as tCO2e/year

EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants in year y (CO2e /MWh)

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

The power density of the project activity is calculated as follows:

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

Where:

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

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

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

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

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

Cap_{PJ} = 82,000,000 W

Cap_{BL} = 0 (since the project is a new hydro power plant)

A_{PJ} = 13,400,000 m2

A_{BL} = 0 (Justification: The project is a new hydro power plant))

Therefore;

PD = (82,000,000 – 0)/(13,400,000 – 0) = 6.119 W/m2

Therefore;

PEy cannot be assumed to be 0. According to ACM0002 Version 20, if the PD is greater than 4 and less than 10 the project emission for hydro plants can be calculated as;

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000}$$

Hence, project emission for this monitoring period is 38,514 tCO_2. Verification team has checked the project emission calculation from the ER sheet /2.2/ and found OK.

Leakage

No leakage has been considered for the project activity.

Emission reductions

Emission reductions are calculated as follows:

Year	Baseline emissions or removals (tCO2e)	Project emissions or removals (tCO2e)	Leakage emissions (tCO2e)	Net GHG emission reductions or removals (tCO2e)
2019 (from 02.12.2019 to 31.12.2019)	4,881	901	0	3,980
2020 (from 01.01.2020 to 31.12.2020)	127,442	23,318	0	104,124
2021 (from 01.01.2021 to 31.12.2021)	77,899	14,295	0	63,604
Total	210,222	38,514	0	171,708

Comparison of the ex-ante and ex-post values:

The ex-ante emission reduction estimations were 98,484 tCO2e per year for the crediting period, however the first monitoring period has revealed a total of 171,708 tonnes of CO2e for 25 months. This approximates to 82,419.84 of net tCO2 ER per annum. Verification team has checked the comparison of the ex-ante and ex-post emission reduction and found that emission reductions for this monitoring period are less than the ex-ante emission reduction.

Opinion:

The verification team confirms that

- The complete data set for the identified and required parameters for the operational days in the current monitoring period was available;
- The reported data has been cross checked with available records, as indicated in the section 4.4 above under each monitored data, wherever appropriate;
- The baseline, project and leakage emissions have been determined in accordance with the requirement of the applied methodologies, as contained in the final monitoring report and corresponding emission reductions spreadsheet;
- The assumptions, emission factors and default values used are justified, as indicated in the section 4.4 above.

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

Evidences (Documents/Zoom interviews by Team Leader/Physical site visit by Local Expert) referred for verification of individual monitoring parameter and fixed parameters are defined under section 4.4. We further confirm that, sufficient evidence covering the entire monitoring period and at the required frequency were available. A list of referred documents for verification is also included in Appendix 1 of this report.

4.6 Non-Permanence Risk Analysis

Not applicable.

5 VERIFICATION CONCLUSION

4K Earth Science Pvt. Ltd (4KES), contracted by 'Ekobil Environmental Services and Consultancy Ltd.', has performed the independent verification of the emission reductions for the VCS project activity (VCS ID- 762) "Grid connected electricity generation from renewable sources: Uzuncayir 82.0 MW Hydroelectric Power Plant Project, Turkey" in Turkey for the monitoring period 02-December-2019 to 31-December-2021 as reported in the Monitoring Report Version 1.1 dated 01/09/2022. The Limak Yatirim Enerji Uretim Isletme Hizmetleri ve Insaat Anonim Sirketi and the respective project proponent are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project activity. It is our responsibility to express an independent verification statement on the reported GHG emission reductions from the project activity.

4KES commenced the verification on the basis of the baseline and monitoring methodology ACM 0002 version 20.0, the monitoring plan contained in the registered VCS PD /04/ and VCS guidelines, Monitoring Report (Version 1.1 dated 01/09/2022) as per the process described under Section 2 of this report.

4KES verification approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. 4KES planned and performed the verification by obtaining evidence and other information and explanations that 4KES considered necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions reported for the project activity for the period 02-December-2019 to 31-December-2021 are fairly stated in the Monitoring Report Version 1.1 dated 01/09/2022. The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology ACM 0002, version 20.0, and the VCS standard.

Verification period: From 02-December-2019 to 31-December-2021

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

Year	Baseline	Project emissions	Leakage	Net GHG emission

	emissions or removals (tCO_2e)	or removals (tCO_2e)	emissions (tCO_2e)	reductions or removals (tCO_2e)
2019	4,881	901	0	3,980
2020	127,442	23,318	0	104,124
2021	77,899	14,295	0	63,604
Total	**210,222**	**38,514**	**0**	**171,708**

Approved by

Chandrakala R.

Director

4K Earth Science Private Limited

Date: 10-September-2022

Place: Bangalore, India

APPENDIX I: LIST OF DOCUMENTS

/1/	/1.1/ Monitoring Report, Version 1.0, dated 18/02/2022 (Initial Version) /1.2/ Monitoring Report, Version 1.1, dated 01/09/2022 (Final Version)
/2/	/2.1/ Draft Emission Reduction calculation sheet (corresponding to initial Version of VCS MR) /2.2/ Final Emissions Reduction calculation Sheet (corresponding to final Version of VCS MR)
/3/	VCS Standard Version 4.3
/4/	Registered VCS PD version 11 dated 26/10/2021 for the 2nd crediting period
/5/	Web-Link for the Registered project activity for Validation Report and Grid Emission factor calculation https://registry.verra.org/app/projectDetail/VCS/762
/6/	Sustainable parameters supportive: Employment records and training records
/7/	Certificate of commissioning of Unit 1, 2 and 3
/8/	Connection Agreement (Agreement between TEİAŞ and the PP)
/9/	System Usage Agreement (Agreement between TEİAŞ and the PP)
/10/	Technical specification of the main equipments (Turbine, Generator etc.)
/11/	Photographic evidence Name plate photos of major eqipments Generator name plates Main and back-up meters displaying the serial numbers (photos)
/12/	Training record
/13/	Single line diagram along with meter location
/14/	Production licence
/15/	Graph to identify the reservoir's surface area using the water level measurements Correlation graph - Reservoir volume and surface area
/16/	Calibration certificates for the energy meters corresponding to this monitoring period
/17/	Monthly export and import values available on the TEIAS and EPIAS PORTAL which are government authorities

/18/	Periodic calibration is indicated as 10 years in article 9 of the following regulation: https://www.mevzuat.gov.tr/File/GeneratePdf?mevzuatNo=6381&mevzuatTur=KurumVeKurulusYonetmeligi&mevzuatTertip=5
/19/	Daily production reports for the monitoring period
/20/	Organization structure

APPENDIX II: VERIFICATION FINDINGS

Clarification Requests

CL ID	01	**Section no.**	4.4	**Date:** 15/08/2022
Description of CL				
Verification team has found that monitoring period "02/12/2019 to 31/12/2021" start date is not consistent with the monthly electricity recording cycle. PP need to clarify how the conservative emission reduction calculation has been done for this monitoring period.				
Project participant response				**Date:** 01/09/2022
The daily production index for December 2019 has been obtained from the project owner and the production value for December 1st has been subtracted from the monthly sum. Net production and emission calculations have been also corrected. You can access the daily production sheet for Dec 1st, 2019 from the link below:				
Documentation provided by project participant				
https://app.box.com/s/1g34a50v56x2hqs4efr2ovd1h25w22ei				
DOE assessment				**Date:** 07/09/2022
PP has subtracted the daily generation data of 1st December 2019 /19/ from the monthly net electricity supplied to the grid /17/ for the month December 2019 which is found OK. Verification team has checked the revised Monitoring report /1.2/ and ER sheet /2.2/ and found OK. Hence this CL is closed.				

Corrective Action Requests

CAR ID	01	**Section no.**	4.4	**Date:** 15/08/2022
Description of CAR				

Verification team has found that monthly electricity export and import reported under the ER sheet /2.1/ is not consistent with the monthly electricity records provided /17/.
Project participant response **Date:** 01/09/2022
The error has been rectified and the calculations for net production and emission have been revised accordingly.
Documentation provided by project participant
Revised MR and ER sheet
DOE assessment **Date:** 07/09/2022
Corrections have been done in the revised ER sheet /2.2/ and Monitoring report /1.2/ and found consistent with the monthly electricity data /17/. Hence this CAR is closed.

CAR ID	02	**Section no.**	4.4	**Date:** 15/08/2022
Description of CAR				
From the ER sheet /2.1/, Verification team has found that yearly calculated project emission has been rounded down which is not a conservative approach.				
Project participant response				**Date:** 01/09/2022
The newly calculated project emission is now correctly rounded up as per the conservative approach.				
Documentation provided by project participant				
Revised ER sheet and Monitoring report				
DOE assessment				**Date:** 07/09/2022
Correction has been done in the revised ER sheet /2.2/ and Monitoring report /1.2/ and found OK. Hence this CAR is closed.				

CAR ID	03	**Section no.**	4.1	**Date:** 15/08/2022
Description of CAR				
PP need to fill section 1.11 of the Monitoring report /1.1/ as per the MR template requirements.				
Project participant response				**Date:** 01/09/2022
Corrections have been done.				

Documentation provided by project participant	
Revised MR	
DOE assessment	**Date:** 07/09/2022
Corrections have been done in the revised Monitoring report /1.2/ and found OK. Hence this CAR is closed.	

CAR ID	04	**Section no.**	4.1	**Date:** 15/08/2022
Description of CAR				
Verification team has found that Monitoring report has referred VCS PD of 1st Crediting period on multiple places. Since the Monitoring period corresponds to the 2nd crediting period, PP need to fill the details accordingly.				
Project participant response				**Date:** 01/09/2022
The error has been corrected.				
Documentation provided by project participant				
Revised MR				
DOE assessment				**Date:** 07/09/2022
Corrections have been done in the revised Monitoring report /1.2/ and found OK. Hence this CAR is closed.				

Forward Action Requests

~~FAR ID~~		~~Section no.~~		~~Date:~~
~~Description of CAR~~				
~~NA~~				
~~Project participant response~~				~~Date:~~
~~Documentation provided by project participant~~				
~~DOE assessment~~				~~Date:~~

APPENDIX III: TEAM COMPETENCE

Certificate of Competence							
Name	☒ Mr. ☐ Ms.	**Chetan Swaroop Sharma**					
Qualification Procedure		*Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GHG Projects.*					
Appointed to work as:							
		CDM Validator/Verifier	**Team Leader**	**Team Member**	**Technical Expert**	**Technical Reviewer**	**Financial Expert**
Appointed		Yes	Yes	Yes	Yes	Yes	No
Appointed Date		27-04-2021					
Authorized to work as Technical Expert for:							
Authorized Technical Area		**Sectoral Scope**		**TA Code**		**Technical Area within the scope**	
		Energy industries (renewable - / non-renewable sources)		1.1		Thermal energy generation	
		Energy industries (renewable - / non-renewable sources)		1.2		Renewables	
		Energy distribution		2.1		Energy distribution	
		Energy demand		3.1		Energy demand	
		Waste handling and disposal		13.1		Solid waste and wastewater	
		Waste handling and disposal		13.2		Manure	
Authorized to work as Local Expert for:							
Country/Countries		India					

Compliance check by: Anand S. R.	

Certificate of Competence		
Name	☒ Mr. ☐ Ms.	**Ma Paa Puratchikkanal**
Qualification Procedure		*Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GHG Projects.*

Appointed to work as:

	CDM Validator/Verifier	**Team Leader**	**Team Member**	**Technical Expert**	**Technical Reviewer**	**Financial Expert**
Appointed	Yes	Yes	Yes	Yes	Yes	No
Appointed Date	27-04-2021					

Authorized to work as Technical Expert for:

Authorized Technical Area	**Sectoral Scope**	**TA Code**	**Technical Area within the scope**
	Energy industries (renewable - / non-renewable sources)	1.1	Thermal energy generation
	Energy industries (renewable - / non-renewable sources)	1.2	Renewables
	Energy demand	3.1	Energy demand
	Construction	6.1	Construction
	Waste handling and disposal	13.1	Solid waste and wastewater
	Waste handling and disposal	13.2	Manure
	Agriculture	15.1	Agriculture

Authorized to work as Local Expert for:

Country/Countries	India and Sri Lanka

Compliance check by: Anand S. R.	

APPENDIX IV: ABBREVIATIONS

BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CL	Clarification Request
EB	Executive Board
EIA	Environmental Impact Assessment
ER	Emission Reductions
FAR	Forward Action Request
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel for Climate Change
MP	Monitoring Period
MR	Monitoring Report
MW	Mega Watt
MWh	MegaWatt hour
PD	Project Description
PP	Project proponent
QA/QC	Quality Assurance/Quality Control
tCO_2	Tonnes of Carbon Dioxide
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCSA	Verified Carbon Standard Association
VCU	Verified Carbon Unit