



OFF GRID SOLAR PV PROJECT AT IAMGOLD ESSAKANE SA GOLD MINE



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Summary:

4K Earth Science Private Limited (4KES) has been contracted by, “Essakane Solar S.A.S.” to undertake verification and certification for the greenhouse gas (GHG) emission reductions reported from ‘Off grid Solar PV project at IAMGOLD Essakane SA Gold Mine’ for the monitoring period 01/01/2021 to 30/06/2022 in the initial monitoring report version 1.0, date 12/07/2022.

“Off-grid Solar PV project at IAMGOLD Essakane SA Gold Mine” (hereafter referred to as the “Project” or “Project Activity”) is a small-scale project activity, which involves the development, construction and operation by Essakane Solar S.A.S. of a greenfield solar PV plant with a total installed capacity of 14.928 MWp at the Essakane gold mine, which is in the Sahel region of Burkina Faso about 330 km North-East from Ouagadougou.

Implementation status of the project activity has been verified during the remote interview, supportive for commissioning /12/ and photos /20/.

Verification team has verified the capacity of the project activity by Microsoft Teams remote interview, technical specification /11/, photographs /20/ and Monthly reports from O&M Contractor /25/ etc.

The net electricity generated from this project is supplied to the buyer (IAMGOLD ESSAKANE S.A.) and PPA is signed between PP and IAMGOLD ESSAKANE S.A. (buyer) /18/ which is still valid. Operation and Maintenance of the project plant is done by Wartsila Burkina Faso as verified from O&M Contract /19/.

The project was commissioned on 01/06/2018 as verified from commissioning certificate /12/.

During current monitoring period i.e. from 01/01/2021 to 30/06/2022, the project activity has supplied 35,083 MWh net electricity to IAMGOLD ESSAKANE S.A., there by resulted in emission reduction of 28,066 tCO₂e. 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 3rd periodic verification of the project activity. In the course of the verification, 03 Corrective Action Requests (CARs) and 01 Clarification (CL) were raised.

The management of the ‘Essakane Solar S.A.S.’ 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 2 dated 29/11/2022. The calculation and determination of GHG emission reductions from the project is the responsibility of the management of the Essakane Solar S.A.S. The development and maintenance of records and reporting procedures are in accordance with the Monitoring Report Version 2 dated 29/11/2022.

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 01/01/2021 to 30/06/2022 based on the reported emission reductions in the final monitoring report Version 2 dated 29/11/2022 for the same period.

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: 01/01/2021 to 30/06/2022

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2021	19,234	0	0	19,234
2022	8,832	0	0	8,832
Total	28,066	0	0	28,066

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1 INTRODUCTION

1.1 Objective

4KES has been commissioned by 'Essakane Solar S.A.S.' to perform verification of its registered VCS project 'Off grid Solar PV project at IAMGOLD Essakane SA Gold Mine', for the reported GHG emission reductions for the given monitoring period 01/01/2021 to 30/06/2022 (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 /13/ and /14/ for the monitoring parameter 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 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 Microsoft Teams video conferencing and found in accordance with the monitoring report /1.2/ and registered Joint PD & MR /05/. Verification team has also verified the technical details of the project equipments and metering arrangement with the supportive documents /09/, /11/, /16/ and /20/ and found correct. Therefore, 4KES confirms that the verification is conducted with reasonable level of assurance.

1.4 Summary Description of the Project

“Off-grid Solar PV project at IAMGOLD Essakane SA Gold Mine” (hereafter referred to as the “Project” or “Project Activity”) is a small-scale project activity, which involves the development, construction and operation by Essakane Solar S.A.S. of a greenfield solar PV plant with a total installed capacity of 14.928 MWp at the Essakane gold mine, which is in the Sahel region of Burkina Faso about 330 km North-East from Ouagadougou.

The Project relies on solar power source through photovoltaic conversion technology to produce electricity, which is delivered to IAMGOLD Essakane S.A. (buyer). The PV array consists of 128,880 thin film (CdTe) photovoltaic modules, including 42,840 of 117.5 W (FS-4117-3 of First Solar Series 4™) and 86,040 of 115 W (FS-4115-3) for a total installed capacity of 14.928 MW.

The Project also includes 6 inverters and 3 transformers located in powerhouses wired to the modules through buried cables. Two medium voltage overhead MV lines (6.6 kV) then connect the project to the offtaker’s busbar.

Implementation status of the project activity has been verified during the remote interview, supportive for commissioning /12/ and photos /20/.

Verification team has verified the capacity of the project activity by Microsoft Teams remote interview, technical specification /11/, photographs /20/ and Monthly reports from O&M Contractor /25/ etc.

The net electricity generated from this project is supplied to the buyer (IAMGOLD ESSAKANE S.A.) and PPA is signed between PP and IAMGOLD ESSAKANE S.A. (buyer) /18/ which is still valid. Operation and Maintenance of the project plant is done by Wartsila Burkina Faso as verified from O&M Contract /19/.

The technical characteristics of the modules, inverters and transformers installed are those in the tables below:

Electrical and mechanical characteristics of the modules (Standard Test Conditions)

Peak Power (W)	115 W	117.5 W
Type of cells	Thin-film CdTe semiconductor	
Rated voltage (V_{mpp}) (V)	69.3	70.1
Rated current (I_{mpp}) (A)	1.66	1.68
Efficiency (%)	16.0	16.3
Length (mm)	1,200	
Width (mm)	600	
Thickness (mm)	6.8	

Technical data of the inverters

Parameter	Unit	Description
Manufacturer		ABB
Model		PVS980, -1909kVA-J

Maximum DC input power ($P_{PV,max}$)	kWp	3,055
Nominal AC output power (SN(AC))	kVA	1,909
Maximum AC output power (Smax (AC))	kVA	2,100
Output frequency range	Hz	50/60
Nominal output voltage	V	630
Maximum efficiency	%	98.8
Own consumption in operation	W	2,500
Own consumption in standby	W	225

Technical data of transformers

Parameter	Unit	Description
Manufacturer	-	ABB
Rated power	kVA	3818
High voltage	V	6600
Low voltage (no load)	V	630 (630)
Rated frequency	Hz	50

The technical details of the project equipment have been verified from Microsoft Teams remote interview, Manufacturer technical specifications /11/ and photographs /20/ etc.

The project was commissioned on 01/06/2018 as verified from commissioning certificate /12/.

The Project is located in north-eastern Burkina Faso (host party), West Africa. It straddles the boundary of the Oudalan and Seno provinces in the Sahel region of Burkina Faso and is approximately 330 km North-East of the capital, Ouagadougou. It is situated 42 km East of the nearest large town and the provincial capital of Oudalan, Gorom-Gorom. Its exact geo-coordinates are provided under section 1.7 of the VCS MR /1.2/. Verification team has verified the physical address through internet /08/ and found consistent.

During current monitoring period i.e. from 01/01/2021 to 30/06/2022, the project activity has supplied 35,083 MWh net electricity to the buyer, there by resulted in emission reduction of 28,066 tCO₂e. The monitoring period subject to this monitoring report is inclusive of first and last day of period.

2 VERIFICATION PROCESS

The registered VCS project is undergoing 3rd verification under VCS (1st 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 Joint PD & MR 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 VCS executive board for issuance of credits as per VCS standard version 4.3.

Duration of Verification:

Verification Contract	10/08/2022
Audit	03/11/2022 (Microsoft Teams remote audit) 17/11/2022 (Microsoft Teams remote interview of stakeholder) 26/11/2022 (WhatsApp remote interview of stakeholder)
Findings raised	20/11/2022
Draft Verification Report	30/11/2022
Final Verification Report	07/12/2022

2.2 Document Review

The verification is performed primarily as a document review of the approved Joint PD & MR 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, Joint PD & MR 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 Microsoft Teams remote interview and interviewed PP representative/O&M Operator/Consultant/Local Stakeholders and reviewed documents to achieve a reasonable level of assurance in the verification. Physical site visit was not possible for the project activity due to security issues as confirmed from PP and public sources¹. This is in line with Section 4.1.2 of the VCS Standard, v4.3 /03/ 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 (Microsoft Teams remote interview).

Location	The Project is located in north-eastern Burkina Faso (host party), West Africa. It straddles the boundary of the Oudalan and Seno provinces in the Sahel region of Burkina Faso and is approximately 330 km North-East of the capital, Ouagadougou. It is situated 42 km East of the nearest large town and the provincial capital of Oudalan, Gorom-Gorom.	
Dates	03/11/2022 (Microsoft Teams remote audit) 17/11/2022 (Microsoft Teams remote interview of stakeholder) 26/11/2022 (WhatsApp remote interview of stakeholder)	
Key points discussed	Name of person, interviewed	Designation, Organization
Project Implementation, Operational data,	Luisa Schiavon	Asset Manager for Total Eren (majority shareholder (>90%) under Essakane Solar S.A.S.)
	Ilboudo Fulbert	Electrical Engineer, Wartsila Burkina Faso

¹ <https://travel.state.gov/content/travel/en/traveladvisories/traveladvisories/burkina-faso-travel-advisory.html>

Calibration, Data collection, QA/QC, procedures, Calculation of ERs, VCS requirements	Gaïa Ludington	Project Manager, Certification & Deliveries, AERA group
Sustainable development Impact, Complaints, Mode of communication, Environmental impact any other concerns	Dr. Bruno Korgo	Local Stakeholder, Lecturer at university
	Mr. Maiga Moctar	Local stakeholder, one of the young leaders of a locality close to the Mine

2.4 Site Inspections

Verification team performed the Microsoft Teams remote interview and interviewed PP representative/O&M Operator/Consultant/Local Stakeholders and reviewed documents to achieve a reasonable level of assurance in the verification. Physical site visit was not possible for the project activity due to security issues as confirmed from PP and public sources². This is in line with Section 4.1.2 of the VCS Standard, v4.3 /03/ 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 Microsoft Teams remote interview. 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;

² <https://travel.state.gov/content/travel/en/traveladvisories/traveladvisories/burkina-faso-travel-advisory.html>

- 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 03 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 also registered under CDM. Verification team has checked the CDM website /06/ to confirm that no CDM MR has been hosted for the current monitoring period. Hence Verification team confirms that there is no double counting associated with project activity being participation of other GHG programs which is also verified from the declaration given by the PP /21/.

3.2 Methodology Deviations

No deviation is applied during the monitoring period or previous monitoring period.

3.3 Project Description Deviations

No deviation is applied during the monitoring period or previous monitoring period.

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

“Off-grid Solar PV project at IAMGOLD Essakane SA Gold Mine” (hereafter referred to as the “Project” or “Project Activity”) is a small-scale project activity, which involves the development, construction and operation by Essakane Solar S.A.S. of a greenfield solar PV plant with a total installed capacity of 14.928 MWp at the Essakane gold mine, which is in the Sahel region of Burkina Faso about 330 km North-East from Ouagadougou.

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Implementation status of the project activity has been verified during the remote interview, supportive for commissioning /12/ and photos /20/.

Verification team has verified the capacity of the project activity by Microsoft Teams remote interview, technical specification /11/, photographs /20/ and Monthly reports from O&M Contractor /25/ etc.

The net electricity generated from this project is supplied to the buyer (IAMGOLD ESSAKANE S.A.) and PPA is signed between PP and IAMGOLD ESSAKANE S.A. (buyer) /18/ which is still valid. Operation and Maintenance of the project plant is done by Wartsila Burkina Faso as verified from O&M Contract /19/.

The project was commissioned on 01/06/2018 as verified from commissioning certificate /12/.

During current monitoring period i.e. from 01/01/2021 to 30/06/2022, the project activity has supplied 35,083 MWh net electricity to the buyer, there by resulted in emission reduction of 28,066 tCO₂e. The monitoring period subject to this monitoring report is inclusive of first and last day of period

During the process of verification, 4KES confirmed the capacity, 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.

The selected monitoring period i.e. 01/01/2021 to 30/06/2022 (both days included) is within the 1st crediting period i.e. 01/06/2018 to 31/05/2025 which is accepted to the verification team.

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 Joint PD & MR & 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 Joint PD & MR & monitoring report are available and implemented in an appropriate manner.

The organisational role and responsibility as mentioned in the registered Joint PD & MR /05/ & monitoring report /1.2/ is followed onsite. All the emergency preparedness as mentioned in the registered Joint PD & MR & monitoring report is followed onsite and no discrepancies were found regarding the same.

The assessment team found that the project is in line with the registered Joint PD & MR, monitoring report, and no deviation on project design or monitoring plan is observed.

Project activity provide local jobs. 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 interviews of local people (Section 2.3 of this report) and supportive documents /22/.

Opinion:

Assessment team concludes the following:

- a) There is no material discrepancies between project implementation and the project description provided in the Joint PD & MR /05/.
- 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 CDM and VCS. Verification team has checked the CDM website /06/ to confirm that no CDM MR has been hosted for the current monitoring period. Hence Verification team confirms that there is no double counting associated with project activity being participation of other GHG programs which is also verified from the declaration given by the PP /21/.

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

The project does not involve major construction activity. It primarily requires the installation of the Solar power plant, transmission line, electricity meter and transformers etc.

Potential impacts and appropriate mitigation measures are presented in detail in the Environmental and Social management system /22/ on the identification and assessment of impacts and in the Environmental and Social Impact Statement report /22/ which have been checked by the verification team. Project activity does not result in direct air pollution, noise and water pollution.

There was no harm identified from the proposed project activity. Hence verification team confirms that there are no significant impacts on air, water, soil quality and ambience due to the project activity.

The project activity doesn't cause negative socioeconomic impacts which is confirmed from the interview of the local people (refer section 2.3 of this report). The project activity creates positive socioeconomic impacts by providing jobs to local people as confirmed from the interview of the local people (refer section 2.3 of this report) and from the supportive documents /22/.

4.2.2 Local Stakeholder Consultation

Local stakeholder consultation has been conducted at the time of project registration. PP has a mechanism for on-going communication with local stakeholders which has been discussed during the Microsoft Teams remote interview. During the monitoring period (from 01-January-2021 to 30-June-2022), there are no comments received for the project activity which was confirmed during the Microsoft Teams remote interview of PP representative & Local stakeholders.

For ongoing stakeholder's communication, any grievance received is analysed at the headquarters in the Zogona district of Ouagadougou or in the Ouagadougou, or at the information centers of the Health, Safety and Sustainable Development Department. Depending on the geographical location of the request, mail is forwarded either to the Corporate Affairs Department (requests at the national level), or to the SSDD Department (requests at the regional level). The grievances are analysed weekly basis and resolution is done by the concerned departments. There is well written procedure/SOP for the grievance handling /24/. During the remote audit, same was confirmed.

During current monitoring period there are no grievances received related to the solar power plant. Thus, assessment team is of the opinion that the ongoing stakeholder mechanism is adequate and appropriate.

4.3 AFOLU-Specific Safeguards

Not Applicable.

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

The verification team was able to confirm that the monitoring plan contained in registered Joint PD & MR/05/ and MR/1.2/ is in accordance with the applied methodology for the project activity i.e. “AMS-I.A. “Electricity generation by the user” Version 16.0” /07/ and its applicable tools.

The parameter stated in the monitoring plan /05/ and the applied methodology /07/ have been fulfilled in the current monitoring period.

The GHG emission reductions were correctly calculated on the basis of the applied methodology AMS-I.A. “Electricity generation by the user” Version 16.0 /07/, Joint PD & MR /05/ and the formulae given in the monitoring report /1.2/.

Parameter monitored:

Verification team confirms through remote interviews and from the document review, the actual monitoring system complies with the monitoring plan mentioned in the registered validated Joint PD & MR /05/. According to the monitoring plan in the registered Joint PD & MR, there is only one monitoring parameter required to be monitored.

1. EG_y (MWh)

		VVB Assessment
Data / Parameter	EG_y	The monitoring parameter, Unit and description are as per the registered Joint PD & MR /05/.
Data unit	MWh/monitoring period	
Description	Annual net output of the solar photovoltaic power plant	
Source of data	Electricity meters	The monitoring parameter is continuously measured by a bidirectional main energy meter (owned by IAMGOLD ESSAKANE S.A., buyer) and check energy meter (owned by Essakane Solar S.A.S., seller) measuring the net electrical energy delivered to IAMGOLD ESSAKANE S.A. (Electricity buyer) installed at each IAMGOLD power station's feed-in points (Wärtsilä 1 & Wärtsilä 2) with accuracy class of 0.2s verified

		during the remote audit, from single line diagram /09/, technical specifications of meters /11/ and meter photos /20/. The source of data is in accordance with the registered Joint PD & MR /05/.
Description of measurement methods and procedures to be applied	Measured continuously by electricity meters and recorded at least once per day. Auxiliary consumption deducted through bi-directional metering.	The monitoring parameter is continuously measured by a bidirectional main energy meter (owned by IAMGOLD ESSAKANE S.A., buyer) and check energy meter (owned by Essakane Solar S.A.S., seller) measuring the net electrical energy delivered to IAMGOLD ESSAKANE S.A. (Electricity buyer) installed at each IAMGOLD power station's feed-in points (Wärtsilä 1 & Wärtsilä 2) with accuracy class of 0.2s verified during the remote audit, from single line diagram /09/, technical specifications of meters /11/ and meter photos /20/. Based on this data, a monthly Joint meter reading /13/ is signed off by Essakane Solar S.A.S. and IAMGOLD ESSAKANE S.A. as confirmed during the remote audit and from monthly Joint meter reading reports /13/. Monthly electricity delivered is invoiced to

		IAMGOLD ESSAKANE S.A. /14/. The measurement methods and procedures are in accordance with the registered Joint PD & MR /05/. The monitoring procedure was verified during the remote audit and found in accordance with the Joint PD & MR/05/.					
Frequency of monitoring/recording	Continuously, aggregated at least annually		The electricity export/import is continuously measured and monthly recorded /13/ as verified during the remote audit and from monthly Joint meter reading reports /13/. The frequency of monitoring/recording is in accordance with the registered Joint PD & MR /05/.				
Value monitored	<table><tr><td>2021</td><td>2022</td></tr><tr><td>24,043</td><td>11,041</td></tr></table>	2021	2022	24,043	11,041		Verification team has verified the reported electricity export/import data with the monthly Joint meter reading reports /13/ and monthly invoices /14/ and found consistent.
2021	2022						
24,043	11,041						
Monitoring equipment	The PowerLogic PM8420 digital meters installed at IAMGOLD power station's feed-in points (Wärtsilä 1 & Wärtsilä 2) have an accuracy of class 0.2S (active energy) and class 0.5S (reactive energy) at the two delivery points. ID of the meters : BA0904		Verification team has checked the meter details during the remote audit, from single line diagram /09/, technical specifications of meters /11/ and meter photos /20/ and found consistent with the details mentioned in the monitoring report				

	Compteur 1 : ME-1706B040-02 (Iamgold, buyer : main) Compteur 2: ME1706B060-02 (Essakane Solar, seller : check) BA0911 Compteur 1 : ME1706B032-02 (Essakane Solar) Compteur 2: ME/1706B257-02 (IamGold)	/1.2/. The energy meters are in accordance with the registered Joint PD & MR /05/. During the monitoring period, no replacement of meter was observed. Initial Calibration /16/ of the energy meters was done in 2017 by the manufacturer Schneider Electric which is checked by the verification team and found OK. Further PP has clarified that no calibration is required for the energy meters which is confirmed from the User manual of the electricity meter /17/ which is also in accordance with the Joint PD & MR/05/ and hence accepted to the verification team. Further check energy meter (owned by Essakane Solar S.A.S., seller) has been installed for the cross-check purpose in case of any fault in the main meter which is accepted to the verification team.
QA/QC procedures to be applied	As per PowerLogic PM8000 Series manual, "all meters are tested and verified at the factory in accordance with International Electrotechnical Commission (IEC) and American National Standards Institute (ANSI) standards. [These] digital power meters typically do not require re-calibration".	QA/QC procedure has been maintained. Initial Calibration /16/ of the energy meters was done in 2017 by the manufacturer Schneider Electric which is checked by the verification team and found OK. Further PP has clarified that no calibration is required for

	Besides the installation of a main & back-up meter at each feed-in point, reconciliation of measurement results between Essakane Solar and IAMGOLD will occur monthly before electricity invoicing takes place. Furthermore, Essakane Solar has installed its own meters at the transformer's point for transmission losses assessment.	the energy meters which is confirmed from the User manual of the electricity meter /17/ which is also in accordance with the Joint PD & MR/05/ and hence accepted to the verification team. Further check energy meter (owned by Essakane Solar S.A.S., seller) has been installed for the cross-check purpose in case of any fault in the main meter which is accepted to the verification team. The electricity supplied to buyer is cross-checked from the monthly invoices /14/ and found consistent.
Purpose of the data	Baseline emissions	The purpose of the monitoring parameter is to calculate the baseline emission which is in accordance with the registered Joint PD & MR /05/.
Calculation method	N/A	The calculation method is in compliance with the registered Joint PD & MR /05/.
Comments	Invoices to the mine serve as a cross-check basis	The electricity supplied to buyer is cross-checked from the monthly invoices /14/ and found consistent.

Opinion: The verification team confirms;

- The monitoring plan has been implemented as per the Joint PD & MR/05/;

- The monitoring complies with the requirement of the applied methodology /07/;
- The information inflow (from data generation, aggregation, to recording, calculation and reporting) is included above under parameter and confirms to the requirement of the Joint PD & MR/05/;
- The values included in the monitoring report and corresponding emission reduction sheet are verified and included under monitoring parameter, wherever appropriate;

Parameters not monitored/ex-ante:

1. Data/Parameter: EF_{CO2, default} (Unit: kg CO₂/kWh)

Description: CO₂ emission factor

	Discussion and verification assessment
Purpose of data	Calculation of baseline emissions
Verified value	0.8 kg CO ₂ /kWh
Source of value	Registered Joint PD & MR /05/ and applied methodology AMS-I.A. Version 16.0 /07/
Justification	It is fixed for the entire crediting period as per the registered Joint PD & MR /05/. The value of the CO ₂ emission factor has been correctly taken as per the registered Joint PD & MR /05/ and Hence accepted by the verification team.

2. Data/Parameter: I (Unit: NA)

Description: Average technical distribution losses

	Discussion and verification assessment
Purpose of data	Calculation of baseline emissions
Verified value	0
Source of value	Registered Joint PD & MR /05/ and applied methodology AMS-I.A. Version 16.0 /07/
Justification	It is fixed for the entire crediting period as per the registered Joint PD & MR /05/. The value has been correctly taken as per the registered Joint PD & MR /05/ and Hence accepted by the verification team.

Opinion:

In the opinion of assessment team, ex-ante parameters value that were applied in the calculations is consistent with Joint PD & MR/05/ and correctly applied in MR /1.2/, emission reductions spreadsheet /2.2/ and justified.

Assessment of Data and Calculation of GHG emission reductions:

According to the approved methodology AMS-I.A. “Electricity generation by the user” Version 16.0 /07/, Emission Reductions are calculated as follows:

Baseline Emissions

The baseline is described by Paragraph 8 of AMS-I.A., Version 16 as “...the fuel consumption of the technology in use or that would have been used in the absence of the project activity to generate the equivalent quantity of energy...”, estimated using one of three possible options.

For the project activity, Option 2 is applied, such that the energy baseline is calculated based on annual electricity generation from project renewable energy technologies as per the below:

$$E_{BL,y} = \sum_i EG_{i,y} / (1 - I)$$

Where:

$E_{BL,y}$	Annual energy baseline; kWh
$\sum_i$	The sum over the group of i renewable energy technologies (e.g. renewable energy technologies for solar home systems, solar pumps) implemented as part of the project activity.
$EG_{i,y}$	The estimated annual output of the renewable energy technologies of the group of i renewable energy technologies installed; kWh
I	Average technical and distribution losses that would have been observed in diesel powered minigrids installed by public programmes or distribution companies in isolated areas, expressed as a fraction.

The emission baseline is the energy baseline calculated in accordance with Paragraph 8(b) of AMS-I.A. times a default emission factor:

$$BE_{CO2,y} = E_{BL,y} * EF_{CO2}$$

Where:

$BE_{CO2,y}$	Emissions in the baseline in year, y ; tCO ₂
$E_{BL,y}$	Annual energy baseline in year, y ; kWh
EF_{CO2}	CO ₂ emission factor; tCO ₂ /kWh

$E_{BL,y}$ is a monitoring parameter, EF_{CO2} and I are ex-ante parameters and justified above in this section.

The baseline emission calculation for the monitoring period is described in the table below:

Month	BE _y	E _{BL,y}	EF _{CO2}
	t CO ₂	MWh	tCO ₂ /MWh
January 21	1,848	2,310	0.8000
February 21	1,621	2,027	0.8000
March 21	1,701	2,126	0.8000
April 21	1,718	2,148	0.8000
May 21	1,412	1,765	0.8000
June 21	1,433	1,791	0.8000
July 21	1,450	1,813	0.8000
August 21	1,485	1,856	0.8000
September 21	1,622	2,028	0.8000
October 21	1,691	2,113	0.8000
November 21	1,654	2,067	0.8000
December 21	1,599	1,998	0.8000
January 22	1,739	2,174	0.8000
February 22	1,533	1,917	0.8000
March 22	1,482	1,853	0.8000
April 22	1,504	1,880	0.8000
May 22	1,232	1,540	0.8000
June 22	1,342	1,678	0.8000
TOTAL	28,066	35,083	

The baseline emission (BE_y) for the monitoring period is:

$$BE_y = 28,066 \text{ tCO}_2 \text{ (rounded down)}$$

Project Emissions

Project emissions are equal to 0 as the project is an installation of a solar power plant which is in accordance to the registered Joint PD & MR /05/ and the applied methodology /07/. Therefore, project emissions are considered zero.

Leakage

Leakage emissions are not considered for the project activity which is in accordance to the registered Joint PD & MR /05/ and the applied methodology /07/.

Emission reductions

Reductions are calculated as follows:

$$ER_y = BE_y - PE_y - L$$

Where:

ER_y = Emission reductions in year y, t CO₂e

BE_y = Baseline emissions in year y, tCO₂e

PE_y = Project emissions in year y, tCO₂e

L = Leakage emissions in year y, tCO₂e

The results of the emission reduction are shown in the table below:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
From 01/01/2021 to 31/12/2021	19,234	0	0	19,234
From 01/01/2022 to 30/06/2022	8,832	0	0	8,832
Total	28,066	0	0	28,066

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

Ex-Ante and Ex-Post emission reductions for the current monitoring period (18 months) are compared as follows:

Ex-ante = As per the Joint PD & MR/05/, Ex ante emission reduction planned for 2021 and 2022 are 20,234 tCO₂e and 19,223 tCO₂e respectively. Thus, ex ante emissions for this monitoring period are 20,234 + 0.5*19,223 = 29,845.5 tCO₂e.

Ex-post = 28,066 tCO₂

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 which is accepted.

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 methodology, 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/Microsoft Teams interviews by Team Leader) 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. Verification team conclude that evidences used to determine the GHG reductions and removals are completely available for the monitoring period (sufficiency of quantity) and are appropriate in quality.

4.6 Non-Permanence Risk Analysis

Not applicable.

5 VERIFICATION CONCLUSION

4K Earth Science Pvt. Ltd (4KES), contracted by 'Essakane Solar S.A.S.', has performed the independent verification of the emission reductions for the VCS project activity (VCS ID- 2434) "Off grid Solar PV project at IAMGOLD Essakane SA Gold Mine" in Burkina Faso for the monitoring period 01-January-2021 to 30-June-2022 as reported in the Monitoring Report Version 2 dated 29/11/2022. Essakane Solar S.A.S. 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 AMS-I.A. “Electricity generation by the user” Version 16.0, the monitoring plan contained in the registered Joint PD & MR /05/ and Monitoring Report (Version 2 dated 29/11/2022) 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 01-January-2021 to 30-June-2022 are fairly stated in the Monitoring Report Version 2 dated 29/11/2022. The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AMS-I.A. “Electricity generation by the user” Version 16.0 and the VCS standard.

Verification period: From 01-January-2021 to 30-June-2022

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

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
From 01/01/2021 to 31/12/2021	19,234	0	0	19,234
From 01/01/2022 to 30/06/2022	8,832	0	0	8,832
Total	28,066	0	0	28,066

Approved by



Chandrakala R.

Director

4K Earth Science Private Limited

Date: 07-December-2022

Place: Bangalore, India

APPENDIX I: LIST OF DOCUMENTS

/1/	/1.1/ Monitoring Report, Version 1.0, dated 12/07/2022 (Initial Version) /1.2/ Monitoring Report, Version 2 dated 29/11/2022 (Final Version)
/2/	/2.1/ Draft Emission Reduction Calculation sheet (corresponding to initial Version of VCS MR) /2.2/ Final Emission Reduction Calculation Sheet (corresponding to final Version of VCS MR)
/3/	VCS Standard Version v4.3 https://verra.org/project/vcs-program/rules-and-requirements/
/4/	VCS Program Guide, v4.2 https://verra.org/project/vcs-program/rules-and-requirements/
/5/	Registered Joint Project Description & Monitoring Report, version 3.0 and dated 05/10/2021 Joint Validation & Verification Report, version 04 and dated 26/11/2021 Web-Link for the Registered project activity: https://registry.verra.org/app/projectDetail/VCS/2434
/6/	Web-Link for the CDM registration https://cdm.unfccc.int/Projects/DB/KBS_Cert1502356514.63/view
/7/	Approved monitoring methodology: AMS-I.A. "Electricity generation by the user" Version 16.0
/8/	Websites referred: http://www.itouchmap.com/latlong.html (Latitude-Longitude location finder)
/9/	Single line diagram showing monitoring points
/10/	Organization structure
/11/	Technical Specifications of major equipments: Energy meter, PV module, Inverter and Transformer
/12/	Commissioning certificate of the solar power plant on 01/06/2018
/13/	Monthly Joint meter readings for the electricity exported/imported for this monitoring period.
/14/	Monthly invoices for the electricity exported/imported for this monitoring period.
/15/	Company registration
/16/	Initial Calibration certificate for the electricity meters dated 14/06/2017 and 16/06/2017 by Manufacturer Schneider Electric
/17/	User Manual for PowerLogic™ PM8000 series, dated December 2015

/18/	Power Purchase Agreement signed between Essakane Solar S.A.S. and IAMGOLD ESSAKANE S.A. dated 03/03/2017
/19/	Operation and Maintenance agreement between Essakane Solar S.A.S. and Wartsila Burkina Faso, dated 19/04/2017
/20/	Name plate pictures for PV modules, Inverter, transformer and meters
/21/	Declaration by PP for No double counting of Emission Reductions dated 16/08/2022
/22/	Supporting document for the sustainability criteria/No net harm: - ENVIRONMENTAL AND SOCIAL POLICY, December 2016 - ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM, June 2017 - ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT report - List of employees
/23/	EIA License
/24/	Email: Confirmation of no comments received during this monitoring period, STAKEHOLDER ENGAGEMENT PLAN, June 2017
/25/	Supportive document for the installed capacity of the project activity: Project monthly report by Wartsila Burkina Faso

APPENDIX II: VERIFICATION FINDINGS

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

This is the 3rd periodic verification of the project activity. There is no remaining FAR from Validation and/or previous Verification. No FAR is pending from CDM Validation or first CDM verification as well.

FAR ID	Xx	Section no.	Date: DD/MM/YYYY
Description of FAR			
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	01	Section no.	4.4	Date: 20/11/2022
Description of CL				

Under the Monitoring report /1.1/, PP has mentioned that calibration of the energy meters is not required. PP need to submit a supportive document to substantiate the statement. Further PP need to clarify how the accuracy of the electricity data is ensured.	
Project participant response	Date: 29/11/2022
Page 146 of submitted document. "Your digital power meter typically does not require re-calibration". Accuracy of the data is ensured by the double check of IAMGOLD billing meters, and Essakane check meters.	
Documentation provided by project participant	
Power logic 8000	
DOE assessment	Date: 30/11/2022
Clarification has been provided by the PP and found OK. Verification team has checked the User manual for energy meter /17/ and found the statement "Your digital power meter typically does not require re-calibration" correct. Both the PP and the electricity purchaser have installed their own energy meter for cross check purposes which is verified from the photos /20/. Hence this CL is closed.	

Table 3. CAR from this verification

CAR ID	01	Section no.	4.1	Date: 20/11/2022
Description of CAR				
PP need to submit the supportive document for the installed capacity of the project activity.				
Project participant response				Date: 29/11/2022
Document submitted				
Documentation provided by project participant				
1905 Essakane PV plant Monthly report May 2019				
DOE assessment				Date: 30/11/2022
Verification team has checked the sample monthly reports by O&M contractor Wartsila Burkina Faso /25/ and photos /20/ to verify the project capacity and found consistent with the Monitoring report /1.2/. Hence this CAR is closed.				

CAR ID	02	Section no.	4.4	Date: 20/11/2022
Description of CAR				
Serial number of energy meters mentioned under section 4.2 of the Monitoring report /1.1/ is not consistent with the photos of the energy meters /20/.				
Project participant response				Date: 29/11/2022
Serial numbers now consistent with pictures				
Documentation provided by project participant				
Electrical system				

DOE assessment	Date: 30/11/2022
Corrections have been done in the revised Monitoring report /1.2/ and found consistent with photos /20/. Hence this CAR is closed.	

CAR ID	03	Section no.	4.1	Date: 20/11/2022
Description of CAR				
Under section 3.1 of the Monitoring report /1.1/, PP need to mention the information about the operation of the project activity(s) during this monitoring period, including any information on events that may impact the GHG emission reductions or removals and monitoring. Any other changes (e.g., to project proponent or other entities).				
Project participant response				Date: 29/11/2022
Added "During this third monitoring period, the project operated normally and no changes occurred".				
Documentation provided by project participant				
MR v2.0				
DOE assessment				Date: 30/11/2022
Correction has been done in the revised Monitoring report /1.2/ and found OK. Verification team has verified the project operation during the remote interviews and the desk review of the submitted documents and found the project operation stable during this monitoring period. Hence this CAR is closed.				

Table 4. FAR from this verification

No FAR raised during this verification.

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

APPENDIX III: TEAM COMPETENCE

<i>Certificate of Competence</i>		
Name	☒ Mr.	Chetan Swaroop Sharma

	☐ Ms.					
Qualification Procedure	Fulfills 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
<i>Appointed</i>	Yes	Yes	Yes	Yes	Yes	No
<i>Appointed Date</i>	26-10-2022					
Authorized to work as Technical Expert for:						
<i>Authorized Technical Area</i>	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:						
<i>Country/Countries</i>	India, Mauritius, Vietnam and Thailand					
Compliance check by: Anand S. R.						

<u>Certificate of Competence</u>		
Name	☒ Mr. ☐ Ms.	Ma Paa Puratchikkanal

Qualification Procedure	<i>Fulfils the requirement as per the appointment of personnel procedure of 4KES for Validation and Verification of CDM/VCS/GS/GHG Projects.</i>										
Appointed to work as:											
	CDM Validator/Verifier	Team Leader	Team Member	Technical Expert	Technical Reviewer	Financial Expert					
<i>Appointed</i>	Yes	Yes	Yes	Yes	Yes	No					
<i>Appointed Date</i>	27-04-2021										
Authorized to work as Technical Expert for:											
<i>Authorized Technical Area</i>	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:											
<i>Country/Countries</i>	India and Sri Lanka										
Compliance check by: Anand S. R.											

APPENDIX IV: ABBREVIATIONS

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	Mega Watt hour
O&M	Operation & Maintenance
PD	Project Description
PP	Project proponent
PPA	Power Purchase Agreement
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