



VCS JOINT VALIDATION & VERIFICATION

REDUCED EMISSIONS FROM IMPROVED AND EFFICIENT COOKING IN UGANDAN COMMUNITIES



Document Prepared by:

4K Earth Science Private Limited

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Summary:

4K Earth Science Private Limited (4KES) has been contracted by PERSISTENTCLIMATE INDIA PRIVATE LIMITED to conduct the joint validation and verification of the project “Reduced Emissions from Improved and Efficient Cooking in Ugandan Communities”, VCS ID: 3045, against VCS Standard version 4.3 /4/.

The joint validation and verification include confirming the project’s design description, project's baseline, monitoring plan and the project’s compliance with relevant VCS and host party criteria and implementation of the monitoring plan of the joint PD & MR (Project ID 3045) and the application of the VCS methodology VMR0006: “Methodology for Installation of High Efficiency Firewood Cookstoves”, Version 1.1/5/. The validity of Methodology (VMR0006, version 1.1) is from 22/07/2021. An on-site visit was conducted to verify the data submitted in the joint PD & MR.

The proposed project Implemented by PersistentClimate India Private Limited with local partners in Uganda seeks to increase access of households and communities to Improved Cookstoves (ICS) by disseminating ICS featuring high thermal efficiency and low greenhouse gas emissions. These ICS shall be distributed across the households and communities in Uganda, replacing previously used traditional devices, typically featuring low fuel efficiency and high rates of emissions among not only greenhouse gas emissions but also particulate matter and other emissions detrimental to health and posing risks of fire. The project objectives include reduction of greenhouse gases, conservation of forests and woodlands as well as improved health conditions of ICS users due to improved indoor air quality along with drudgery reduction in everyday cooking.

The estimated annual average emission reductions over a 10 year period of first crediting period are 334,229 tCO₂e/year. The total emission reductions for 10 years crediting period will be 33,42,291 tCO₂e. Total GHG emission reduction in first monitoring period 02/01/2021 to 31/07/2022 is 147,136 tCO₂e.

The review of the joint PD & MR and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and stakeholders have provided 4KES with sufficient evidence to validate the fulfillment of the stated criteria. The purpose of the validation is to have a thorough and independent assessment of the proposed project activity against the applicable VCS requirements, in particular, the project's baseline, monitoring plan and the project’s compliance with relevant VCS and host party criteria. These are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation & Verification is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of emission reductions. 4KES’s objective is to perform a thorough, independent assessment of the joint validation & verification of the project activity.

The validation scope is defined as an independent and objective review of the joint PD & MR. The joint PD & MR is reviewed against the relevant criteria and guidance documents provided by VCS which included: VCS Program Guide (v4.2, dated 22/06/2022)/3/, VCS Standard (v4.3, dated 22/06/2022)/4/, Program Definitions (v4.2, dated 22/06/2022)/3/, Registration & Issuance Process (v4.2, dated 22/06/2022)/3/ applicable at the time in order to confirm that the project meets the applicability conditions of the selected baseline and monitoring methodology namely VMR0006,

version 1.1 and also assess the claims and assumptions made in the joint PD & MR without limitation on the information provided by the project proponents.

The purpose of the verification is to review the joint PD & MR for the monitoring results and verify that monitoring methodology was implemented according to monitoring plan and monitoring data, further based on review of ER sheet confirm that the reductions in anthropogenic emissions by sources is sufficient, definitive and presented in a concise and transparent manner. In particular, monitoring plan, joint PD & MR, ER sheet and the project's compliance with relevant VCS, UNFCCC and host party criteria are verified in order to confirm that the project has been implemented in accordance with design and conservative assumptions, as documented. The scope of the verification included as verification of project implementation and operation with respect to the joint PD & MR, implemented monitoring plan with the joint PD & MR and applied baseline and monitoring methodology, the actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan. Evaluation of the GHG emission reduction data and express a conclusion with a reasonable level of assurance about whether the reported GHG emission reduction data is free from material misstatement, confirmation of reported GHG emission data is sufficiently supported by evidence. A risk based approach has been followed to perform this verification. In the course of joint validation & verification, 06 Corrective Action request (CARs) and 06 Clarification request (CLs) were raised and successfully closed. There is no FAR raised.

4KES confirms that the project is meeting the criteria specified by joint PD & MR template version 4.1/12/, VCS Standard version 4.3/4/ and applied methodology VMR0006, version 1.1/5/, hence be successfully validated, verified and further certified for emission reductions under VCS. 4KES confirms a combined positive validation and verification opinion confirming the project complies with the applicable VCS requirements, thus recommending the project for registration and issuance.

Our opinion relates to the project GHG emissions and the resulting GHG emission reductions reported and related to the valid project baseline and monitoring and its associated documents. Based on the information seen and evaluated we confirm that the emission reductions from the project activity "Reduced Emissions from Improved and Efficient Cooking in Ugandan Communities" during the period 02/01/2021 to 31/07/2022 (including both days) amount to 147,136 tonnes of CO₂e.

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1 INTRODUCTION

1.1 Objective

4KES has been contracted by PERSISTENTCLIMATE INDIA PRIVATE LIMITED (project proponent), to undertake the joint validation & verification of the energy efficiency improved project titled “Reduced Emissions from Improved and Efficient Cooking in Ugandan Communities”. The verifiers have reviewed the GHG data collected for the monitoring period from 02/01/2021 to 31/07/2022 (both days included) covered in this verification. The objective of the joint validation and verification is to have an independent third party assessment of the joint PD & MR and supporting documentation to ensure compliance with the rules, regulations and guidelines by CDM and VCS requirements. In particular;

- The project's baseline is assessed against “VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1.1”/5/
- The project’s monitoring plan is assessed against “VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1.1”/5/
- The project’s additionality justification is assessed against “VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1.1”/5/
- The projects compliance with, the requirements of Article 12 of the Kyoto Protocol, the CDM Modalities and Procedures as agreed in the Marrakech Accords under decision 3/CMP.1, the annexes to this decision, subsequent decisions and guidance made by COP/MOP & CDM Executive Board and other relevant rules, including the Host Country legislation and sustainability criteria along with VCS standard version 4.3
- CDM project standard, version 03.0/9/
- CDM validation and verification standard, version 03.0/9/
- VCS Standard v4.3 /4/
- VCS Program Guide v4.2 /3/

Validation and verification are a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of verified carbon units (VCUs). This report contains the findings and resolutions from the joint validation and verification of the project activity.

1.2 Scope and Criteria

For validation:

The validation scope is given as an independent and objective review of the project design, the project’s baseline study and monitoring plan (VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves,

Version 1.1)/5/ which are included in the joint PD & MR and other relevant supporting documents. The scope of work covered in the validation is described below:

- To validate whether the project activity meets the requirements of VCS Standard and VCS program guide including additionality, proof of title and compliance with local laws.
- To evaluate whether the baseline and monitoring plan are in conformance with the applied methodology from the VCS approved GHG program.
- To confirm that the information presented are completed, consistent, transparent and free of omission or material error.
- Background investigation and follow up interviews.
- Issuance of draft validation report with CARs, CLs & FARs, if any.
- Final validation opinion.

The information in the joint PD & MR is reviewed against the criteria of VCS Standard, the VCS program guide and the applied VCS methodology.

4KES has performed validation based on a risk based approach focusing mainly on the significant risks to meet the qualification criteria and the ability to generate Verified Carbon Units (VCUs).

For Verification:

The scope of the verification is the independent and objective review and ex-post determination of the monitored reductions in GHG emissions from “Reduced Emissions from Improved and Efficient Cooking in Ugandan Communities”. The verification of this project is based on the joint PD & MR and supporting documents submitted by the project proponent to the verification team. The documents were reviewed against the following guidance and protocols:

- VCS Program Guide (v4.2, dated 22/06/2012)/3/
- VCS Standard (v4.3, dated 22/06/2022)/4/
- VCS Program Definitions (v4.2, dated 22/06/2022)/3/
- VCS Registration & Issuance Process (v4.2, dated 22/06/2012)/3/
- VCS approved methodology VMR0006 (version 1.1, dated 27/07/2021)/5/

The validation & verification is not meant to provide any consulting towards the client. However, stated request for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 Level of Assurance

The level of assurance of the verification report falls under reasonable assurance engagements as selected by the Client. The verification team verified the monitoring data for all the parameters of the monitoring plan and confirms that the reported emission reductions are free from any type of material errors.

1.4 Summary Description of the Project

The proposed grouped project is the distribution of improved cookstoves (ICS) among households and communities in Uganda with the objective to displace traditional, unimproved cookstoves and open fires for cooking. The project technology (improved cookstoves) under the proposed grouped project have an average lifespan of 7 years and minimum thermal efficiency of 25%. These ICS are designed to improve combustion efficiency, when compared to the traditional methods of cooking and devices deployed for cooking, and to reduce the heat loss with highly improved combustion efficiency by enabling regulation of the oxygen/air supplied to the chamber to ensure better burning (complete combustion means less CO and other side-emissions and thus, more health benefits as well). Moreover, the design of these ICS result in reduction of particulate matters and carbon emissions. The ICS manufactured currently and envisaged for inclusion under the proposed grouped project are made up of a fuel chamber for combusting the renewable biomass. The pot-rest is above the fuel chamber.

The ICS distributed and/or will be distributed/implemented under the proposed grouped project are not fixed in terms of their designs and models, however, CME/PP will continuously be focused on design improvements to benefit the end users in all aspects including, faster/efficient cooking, safety from shoot/smoke emission, less fuel consumption and thus money savings etc. This will be assessed and implemented by the CME with local manufacturer/assembling partners. As such the project is not limited to the distribution of a specific ICS model or type throughout the crediting period, however all ICS must comply with the eligibility criteria as stipulated in section 1.4 of the joint VCS PD&MR. Regardless of new insights in ICS design improvement, any ICS model (wood/charcoal) included in the grouped project will remain valid in terms of generating carbon offsets and other co-benefits as mentioned above throughout the lifetime of the grouped project period until the CME/PP chooses to discontinue crediting of the improved stoves.

The ICS distributed under the grouped project could be traced throughout the instances crediting period as each ICS under the grouped project are allocated with unique serial number which can be further back traced in a central/master database and maintained by the PP. A record keeping system with unique identification of the ICS will be maintained by PP. Further user's information collected through the beneficiary agreement and compiled in ICS distribution records (ICS Receipts). The information recorded include among other: username, date of distribution, ICS model, number of ICS, Unique identification number/serial number and address/location of the user. Thus record keeping system will ensure that each ICS can be traced to monitor appropriately throughout the crediting period and hence the double counting can be avoided.

The grouped project under the first instance will distribute the following three models of stoves:

- I. Burn Kuniokoa cookstove (wood fired)
- II. Burn Jikokoa cookstove (charcoal fired)
- III. Masupa cookstove (charcoal fired)

The efficiency & installation details of each of the stoves are as follows:

Stove type	Burn Jikokoa stove	Masupa stove	Kuniokoa stove
Stoves considering in the monitoring period	12559	982	547
Efficiency of ICS/16/	0.537	0.382	0.424

All the project activity instances in the proposed grouped project activity would be located within geographical boundaries of Uganda.

The project plans to distribute 12,500 ICS during Phase-1 (year-1) and 37,500 ICS during Phase-2 (year-2), which was also confirmed during the interviews.

The age of each ICS has been calculated separately at the end of the monitoring period since the date of distribution/purchase is not the same for each ICS. Subsequently, the average age is calculated, which accounts for the actual number of days/year crediting of each stove in the monitoring period. The VVB has verified the calculation pertaining to the average age of the project ICS being credited under the applied monitoring period under the newly added tab: "Average Age calculation". The VVB also acknowledge that conservative between the weighted average (leading to consolidated ER as 147,137 tCO₂) and simple average age (leading to consolidated ER as 147,136 tCO₂) of the project ICS is applied to calculate the Stove Days/ stove year for ER calculation which yield. The VVB confirms that such a difference is due to decimal rounding in the excel worksheet.

Hence, although the ERs are claimed from the start date of crediting period (02/01/2021), but only the ICS which has been distributed on or after 02/01/2021 will claim ERs from date, rest all ICSs will claim the ERs from the date of distribution, which is found logical, hence acceptable.

The estimated annual average emission reductions over a 10-year period of first crediting period are 334,229 tCO₂e/year. The total emission reductions for 10 years crediting period will be 3,342,291 tCO₂e. Total GHG emission reduction in first monitoring period, 02/01/2021 to 31/07/2022, is 147,136 tCO₂e. This was confirmed based on the review of joint PD & MR, ER verification spreadsheet/2/ and ICS database/19/.

2 VALIDATION AND VERIFICATION PROCESS

2.1 Method and Criteria

Validation was conducted using 4KES procedures in line with the requirements of VCS Standard, version 4.3 /4/ and the requirements specified in the CDM M&P, the latest version of the CDM Validation and Verification Standard/9/, VCS validation and verification manual version 3.2 /4/ and relevant decisions of the COP/MOP and the CDM EB and applying standard auditing techniques.

The validation consisted of the following phases:

- Document review;
- On-site assessment;
- Resolution of outstanding issues
- Issuance of the validation opinion

Verification was conducted using 4KES's procedures in line with the requirements specified in the VCS Requirements, i.e. VCS Program Guide version 4.2/3/ and VCS Standard version 4.3/4/. The GHG emission reductions are on the basis of approved methodology VMR0006- Methodology for Installation of High Efficiency Firewood Cookstoves, version, 1.1/5/.

The verification consisted of the following three phases

- Document review;
- On-site assessment;
- Resolution of any material discrepancy and the issuance of the final verification report and certification.

The following sections outline each step in more detail.

2.2 Document Review

The VCS joint PD & MR, version 1.1 dated 06/07/2022 (initial version) and version 2.3 dated 10/01/2023 (final version)/1/, in particular the applicability of the methodology, the baseline determination, the additionality of the project activity, the starting date of the project, the monitoring plan, the Emission Reduction Calculations Excelsheet (ex-ante), version 1.1, dated 06/07/2022 and version 2, dated 10/01/2023/2/, Emission Reduction Calculations Excelsheet (ex-post), version 1.1, dated 06/07/2022 and version 2, dated 10/01/2023/2/ were assessed as part of the validation and verification.

2.3 Interviews

The VVB has conducted the on-site visit (with the help of Local Expert & Technical Expert) for the joint validation and verification of the project activity. Further the validation and verification Team Leader was also remotely present to check/verify on-ground information collected by Local & Technical Expert. The on-site visit & remote interviews took place between 28/09/2022 to 29/09/2022 in Uganda. The key personnel interviewed and main topics of the interviews are summarized in the table below:

S. No	Name	Role/Organization	Date	Audit Team
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1	Mr. Prakash Kumar Mishra	Director, PERSISTENTCLIMATE INDIA PRIVATE LIMITED	28/09/2022	Rohit Badaya (remotely through Microsoft teams) Mr. Aziz Wakibi (On-site visit)
2	Mr. Lister Byamugisha	Managing Director, EZY LIFE HOLDINGS LTD	28/09/2022	Rohit Badaya (remotely through Microsoft teams) Mr. Aziz Wakibi (On-site visit)
3	Margaret	Representative, Masupa Enterprises	28/09/2022	Rohit Badaya (remotely through Microsoft teams) Mr. Aziz Wakibi (On-site visit)
4	Rebecca Namuyanja	Stakeholder	28/09/2022	Rohit Badaya (remotely through Microsoft teams) Mr. Aziz Wakibi (On-site visit)
5	Ivan Mukhowe	Team Leader, EZY LIFE HOLDINGS LTD	28/09/2022	Rohit Badaya (remotely through Microsoft teams/Whatsapp call) Mr. Aziz Wakibi (On-site visit)
6	Jackson Namulembwa	Area Mobilizer	28/09/2022	Rohit Badaya (remotely through Microsoft teams/Whatsapp call) Mr. Aziz Wakibi (On-site visit)
7	Obula Calvin	Sales & Marketing representative, Masupa Enterprises	29/09/2022	Mr. Aziz Wakibi (On-site visit)
8	Kyamulabi Margrate	Managing Director, Masupa Enterprises	29/09/2022	Mr. Aziz Wakibi (On-site visit)
9	Lister Byamugisha	Managing Director, EZY LIFE HOLDINGS LTD	29/09/2022	Mr. Aziz Wakibi (On-site visit)
10	Sseruwu William	Supervisor, Masupa Enterprises	29/09/2022	Mr. Aziz Wakibi (On-site visit)
11	Ssensuwa Sam	Technician, Masupa	29/09/2022	Mr. Aziz Wakibi (On-site visit)
12	Umar Mawanda	Production Manager, Masupa	29/09/2022	Mr. Aziz Wakibi (On-site visit)
13	Muwonge Joel	Technician, Masupa	29/09/2022	Mr. Aziz Wakibi (On-site visit)

14	Nampijja Zainah	Lecturer/Researcher, Makerere University	29/09/2022	Mr. Aziz Wakibi (On-site visit)
15	Sylvia Aarakit	MUBS- Lecturer/ Researcher	29/09/2022	Mr. Aziz Wakibi (On-site visit)
16	Ssendagire Jessca	ABCA-Uganda	29/09/2022	Mr. Aziz Wakibi (On-site visit)
17	Fred Barasa	Household (ICS end- user)	28/09/2022	Mr. Aziz Wakibi (On-site visit)
18	Agatha Atukunda	Household (ICS end- user)	28/09/2022	Mr. Aziz Wakibi (On-site visit)
19	Nassimbwa Caroline	Household (ICS end- user)	28/09/2022	Mr. Aziz Wakibi (On-site visit)
20	Namataka Joseline	Household (ICS end- user)	29/09/2022	Mr. Aziz Wakibi (On-site visit)
21	Namali Faridah	Household (ICS end- user)	29/09/2022	Mr. Aziz Wakibi (On-site visit)
22	Nasindi Norah	Household (ICS end- user)	29/09/2022	Mr. Aziz Wakibi (On-site visit)
23	Olivia Muyama	Household (ICS end- user)	29/09/2022	Mr. Aziz Wakibi (On-site visit)
24	Nagudu Alaisa	Household (ICS end- user)	29/09/2022	Mr. Aziz Wakibi (On-site visit)
25	Namono Brenda Lillian	Household (ICS end- user)	29/09/2022	Mr. Aziz Wakibi (On-site visit)
26	Kakai Aminah	Household (ICS end- user)	29/09/2022	Mr. Aziz Wakibi (On-site visit)
27	Namataka Jackline	Household (ICS end- user)	29/09/2022	Mr. Aziz Wakibi (On-site visit)

2.4 Site Inspections

The VVB has conducted the on-site visit (with the help of Local Expert & Technical Expert) for the joint validation and verification of the project activity. Further the validation and verification Team Leader was also remotely present to check/verify on-ground information collected by Local & Technical Expert. The on-site visit took place

between 28/09/2022 to 29/09/2022 in Uganda. The following was carried out during the on-site visit/ remote interviews:

- An assessment of the project design and technical specification, project location, implementation status and operation of the project activity as per the joint PD & MR;
- A review of information flows for generating, aggregating and reporting the monitoring parameters;
- Interviews with relevant personnel to determine whether the operational and data collection procedures are implemented in accordance with the monitoring plan in the joint PD & MR;
- A cross check between information provided in the joint PD & MR and data from other sources such as ICS database, survey records or similar data sources;
- A check of the ICS working and observations of monitoring practices against the requirements of the joint PD & MR, the applied methodology including applicable tool(s), and, where applicable, the applied standardized baseline;
- A review of calculations and assumptions made in determining the GHG data and emission reductions;
- An identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.
- The assessment team has verified sufficient appropriate audit evidences, to reduce audit risk to an acceptably low level as requisite to achieve reasonable level of assurance for the current verification.

The VVB conducted the acceptance sampling to check the monitoring surveys results. Verification team has determined acceptance sample size for all the sample survey parameters based on the Table-2 and guidance provided under para 28-33 of standard “Sampling and surveys for CDM project activities and programmes of activities” version 9.

Parameters	Producers risk	Consumers risk	AQL	UQL	Sample size (n)	Acceptance Number (c)
Monitoring parameters	10%	10%	0.5%	20%	11	0

During the on-site visit a sampling approach has been used by the audit team to verify the reported values for the monitored parameters in the joint PD & MR. The sampling approach included households which have been included in the monitoring survey by the CME. Accordingly, the audit team verified a total of 11 Samples as per the details provided in Section 2.3 above and observed that the sampling survey results of the PP for all the checked HHs were found to be correct and hence acceptable. Thus the results of the monitoring parameters as available in the joint PD & MR were confirmed and found correct.

2.5 Resolution of Findings

The objective of this joint validation & verification is to resolve any outstanding issues which need to be clarified for 4KES's positive conclusion on the project description. To guarantee transparency a validation/verification protocol has been customized for the project. The protocol shows in a transparent manner the requirements, means of verification and the results from verifying the identified criteria. The validation/verification protocol consists of three tables; the different columns in these tables are described below.

A corrective action request (CAR) is raised if one of the following occurs:

- Non-conformities with the monitoring plan or methodology are found in monitoring and reporting, or if the evidence provided to prove conformity is insufficient;
- Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impair the estimate of emission reductions;
- Issues identified in a FAR during validation/verification to be verified during verification have not been resolved by the project participants.

A clarification request (CL) is raised if information needs to be more to determine whether the applicable VCS requirements have been met.

In summary, 6 CLs and 6 CARs were raised during this joint validation & verification which were closed successfully and details are given under Appendix 3 of this report.

2.5.1 Forward Action Requests

No FAR is raised during the joint Validation and Verification process.

3 VALIDATION FINDINGS

3.1 Project Details

The project is a grouped project and has 1 project instance. The proposed grouped project aims to reduce greenhouse gas emissions by distributing fuel-efficient Improved Cook Stoves (ICS) in various regions of Uganda. The proposed Project implemented by PersistentClimate India Private Limited with local partners in Uganda seeks to increase access of households and communities to improved cookstoves by disseminating Improved Cook Stoves featuring high thermal efficiency and low greenhouse gas emissions. These ICS shall be distributed across the households and communities in Uganda, replacing previously used traditional devices, typically featuring low fuel efficiency and high rates of emissions among not only greenhouse gas emissions but also particulate matter and other emissions detrimental to health and posing risks of fire. The project primarily targets one improved cookstove per household and if more than one improved cookstove is distributed, the same shall be discounted and counted as one. Burning fuelwood in such traditional devices is representative for the scenario existing prior to the implementation of the proposed Project.

The implementation of this grouped project will result in the reduction of firewood/charcoal consumption & associated greenhouse gas emissions in a sustainable manner. Project objectives include reduction of greenhouse gases, conservation of forests and woodlands as well as improved health conditions of ICS users due to improved indoor air quality along with drudgery reduction in everyday cooking. As each distributed ICS represents a project unit included in the proposed project, the individual households using the ICS will sign an agreement waiving their rights to carbon credits, acknowledging the same. The project proponent is intentional to educate the users of the ICS' regarding its associated economic, social, and environmental benefits. This will help in creating awareness amongst interested stakeholders.

The estimated annual average GHG emissions reductions through the implementation of the Project is 3,34,229 tCO₂e (rounded down) with a total of 3,342,291 tCO₂e for the entire crediting period. The first monitoring period for the project is 02/01/2021 to 31/07/2022.

Project Proponent:

The project proponent and their responsibility are clearly defined under Section 1.5, 1.6, 1.7 and other relevant sections of the joint VCS PD&MR. PERSISTENTCLIMATE INDIA PRIVATE LIMITED is the project owner/project developer with carbon credit rights transfer agreement executed with end users. This is evident from end user agreements (ICS Receipts). EZYLIFE HOLDINGS LTD is another entity (local distribution partner) which is involved in this grouped project activity.

Project start date:

The starting date of project activity is 02/01/2021 on which the first batch of project ICS were installed and commissioned. This is checked from project database and sales receipts. The start date is in line with the VCS Standard.

Project crediting period:

A crediting period of 10 years has been chosen for the project activity. The crediting period is from 02/01/2021 until 01/01/2031.

Project scale and estimated GHG emission reductions or removals:

The estimated average annual emission reductions from the project are estimated to be on the average 3,34,229 tCO₂e per year over the crediting period of 10 years. Projects are categorized by size according to their estimated average annual emission reductions or removals according to VCS Standard. Since the estimated annual emission reductions resulting from the project are more than 300,000 tCO₂e, the category of the project is defined as "Large Project" as per the VCS Standard.

Project Location:

The geographic boundaries, within which project technologies (ICS) shall be distributed in the various districts within the political boundaries of the host country of Uganda. The geo-coordinates of Uganda are as follows:

Latitude	Longitude
1° 21' 54.6786" N	32° 18' 16.7418" E

The physical location of each device/ICS distributed as a project activity instance under the proposed grouped project will form the actual project activity instance boundary. The districts (Mbale, Jinja, Tororo, Wakiso, Sironko tc, Kampala, Manafwa) are covered in the first verification and the same has been checked through the project database /18/19/.

Project compliance with applicable laws, statutes and other regulatory frameworks:

The project does not require any specific license/approval from host country. End users voluntarily install ICS with financial support from the project proponent. This is cross checked while interviewing project proponent and end users. However, the entitlement of the emission reductions generated by the project is transferred to the project developer from the beneficiary households through mutually agreed agreement

Ownership and other programs:

Right of use: The ownership of the emission reductions belongs to project developer/project owner as confirmed through end user agreement copies/13/. The manufacturers of the ICS and local partners shall also not claim any GHG benefits from the projects under this grouped project and the agreement shall be signed by respective parties. The same was also confirmed during the conducted interviews.

Emissions trading programs and other binding limits: Net GHG emission reductions or removals generated by the project will not be used for compliance with an emissions trading program or for meeting binding limits on GHG emissions. The same is confirmed during the interviews.

Eligibility criteria for grouped projects: The eligibility criteria for inclusion of new project activity instances under this grouped project has been assessed by the audit team as given below.

S. No.	Criterion	Justification by PP	Audit team conclusion
1	Defined geographical boundary	The new project instance boundary shall be confined to national boundaries of Uganda.	The records of household location under the ICS Installation database has been checked and found that the grouped project is located in Uganda. The geographical boundary was also confirmed at the time of visit.
2	Conditional to avoid double counting	To prevent double counting of ICSs distributed under the	Each of the ICS has the unique serial number, which prevents the double

		project, ICS shall be uniquely marked, and new project instance implementers shall provide assurances/declarations that they are not included in any other CDM or Voluntary GHG offset schemes outside of this project	counting, which was also confirmed at the time of site visit. Further the project database/19/ has also been checked and found that all the ICS has unique serial number and hence there is no possibility of double counting of ICS distributed under the project. Further the written attestation/20/ from the project proponent/implementer confirming that the ICSs distributed in the new project instance are not part of any other CDM or Voluntary GHG trading scheme has been submitted and found correct.
3	The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications	All technologies implemented in the project must demonstrate a minimum thermal efficiency of 25%.	The thermal efficiency test results/16/ have been checked and found that the thermal efficiency is greater than 25% and hence the minimum thermal efficiency requirement of 25% has been met and found correct. Further it was confirmed that the thermal efficiency of ICS stove is greater than 25% at the time of site visit. Hence this is also inline with the efficiency testing measures stipulated under VERRA applied methodology.
4	Additionality	The new instance shall adhere the additionality requirements of the VMR0006.	The additionality criteria have been defined in the joint VCS PD & MR and new instances will adhere to the additionality requirements of the VMR0006.
5	Baseline	The new instance shall adhere the baseline requirements of the VMR0006.	The baseline scenario has been defined in the joint VCS PD & MR as per the requirements of the

			VMR0006 and new instances will adhere to the identified baseline scenario.
6	The conditions that ensure that new project instances meet the requirements pertaining to the demonstration of additionality in VCS Standard.	The additionality shall be demonstrated as per the provisions laid down in methodology VMR0006.	A review is made on Uganda environmental laws and regulations/23/33/34/ has been carried out and found that there is no mandatory legal requirement for installation of cookstoves in households/ institutions of Uganda. Further the following rules/regulations have also referred: a) The National Environment Act, 2019/43/ b) The National Environmental (Audit) Regulations, 2020/44/ c) The National Environment (Environmental and Social Assessment) Regulations, 2020/45/. d) National Environment Action Plan (NEAP) and National Environment Management Policy (NEMP) of 1994/46/. e) National Forestry and Tree Planting Act (hereafter Forest Act), Laws of Uganda(Uganda Law Reform Commission)/47/ f) The 1995 Constitution of Uganda/48/ g) The National Environment Act, 1995/49/ Hence there is no mandatory legal requirement for installation of cookstoves in households/institutions of Uganda. Further all the additionality requirements as per the Section 3.5

			of the joint VCS PD & MR shall be followed.
7	Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance	Under this project, new project instance operators shall be required to provide an affirmation that funding from annex I parties, if any, does not result in a diversion of official development assistance	PP has confirmed in the joint VCS PD & MR that for this project activity instance, no funding from Annex-1 parties is received. The future project instance operators shall sign ODA declarations/20/ for new project instances implemented by them to attest that no funding from Annex 1 parties that leads to diversion of ODA has been used in the project.
8	The Group project specific requirements stipulated by the project proponent including any conditions related to undertaking local stakeholder consultations and environmental impact analysis	The local stakeholder consultation will be conducted at the initially during the group PD level. Each new project instance/project will be implemented in similar social economic situations. The key stakeholders of the program both at group project activity and new project instance level are the same. No further actions needed at the new project instance level to satisfy the eligibility criteria.	The stakeholder consultation meeting/21/ has been conducted at the Uganda level and since the stakeholders in the future will be within the boundaries of the Uganda and hence the stakeholder requirements for the future instances have been met.
9	Where applicable, the conditions related to sampling requirements for the group project in accordance with the "Standard for sampling and surveys for CDM project activities and programme of activities"	Monitoring of all new project instances will adhere to all requirements related to sampling for a group project activity in accordance with the sampling guidelines, i.e. "Sampling and surveys for CDM project activities and programmes of activities", version 04.	The current grouped project has followed the latest Guideline "Sampling and surveys for CDM project activities and programmes of activities", version 04/6/ and hence found meeting the sampling requirements. PP has confirmed that the future instances will also follow the above version 09 of the Sampling Standard and hence found correct.

10	Approval of new project instance by project proponent	The project proponent approves each project instance to be included into its registered group project activity.	In the current grouped VCS-PD, the project proponent is also the project implementer, hence no further declaration/approval is required. However for the cases for future instances, where implementer is different from the PP, an approval on the same shall be provided by PP in order to include the instance into this grouped project.
11	VER ownership	End users receiving ICSs under the specific new project instance contractually cede their rights to claim and own emission reductions under the VCS to the project proponent of the group project.	A default distribution agreement /13/ for end users including the provision that emission reductions generated by the ICS are owned by the project proponent will be provided for each new project instance. For the current instance, the end-user agreements have been submitted.
12	Start date of the new instance	All future instances shall have the start date after the date of first instance.	PP has confirmed that the evidences to support the start date of future instances shall be submitted.
13	Applicability of VCS methodology	All future instances shall fulfill the all-applicability criteria of VCS methodology VMR0006.	The new project instances will comply with the requirements of the applied methodology VMR0006, ver1.1. The ICS deployed in the households have an efficiency greater than 25% as checked from the ICS thermal efficiency test reports and hence found correct. Further the justification shall be part of 'Monitoring Report' during the first time inclusion of any new instance.
14	Awareness and agreement of those operating a new project instance on	Contractual provisions to ensure that those operating the new project instance are aware and have agreed that	A declaration/20/ from the project proponent/implementer, stating that they are aware and have agreed that their activity is being subscribed to

	group project subscription	their activity is being subscribed to the new project instance.	the group project will be provided for each new project instance. Since, for this instance, project proponent is the only implementer, no further requirements related to awareness and agreement on their instance to be subscribed under this grouped project.
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Additional information relevant to the project

Commercially sensitive information: Not applicable.

Any further information: Not applicable.

VVB confirms that the joint PD & MR provides accurate description of pre-project scenario and project scenario and complete in describing the project activity and its implementation.

3.2 Participation under Other GHG Programs

The project has not been registered or seeking registration under other GHG programs as confirmed through the registries of the other Standards (like GS, CDM, GCC etc.). PP has also provided a declaration for the same, which is found appropriate. The same has also been confirmed through the conducted interviews for the project activity.

Other forms of environmental credit sought or received: The project has not created another form of environmental credit. The same has also been confirmed through the conducted interviews for the project activity.

Rejection by other GHG programs: The project has not been rejected by other GHG programs as confirmed through the registries of the other Standards (like GS, CDM, GCC etc.). The same has also been confirmed through the conducted interviews for the project activity.

3.3 Safeguards

3.3.1 No Net Harm

The project activity involves energy savings through the use of efficient cooking stoves (ICS). There is no negative environmental and socio-economic impact from the project activity. The project activity promotes environmental and socio-economic well-being as it results in zero GHG emissions due to installation and operation of clean

technology. This is as per the requirements of the VCS Standard (version 4.3) and deemed acceptable to the audit team.

3.3.2 Local Stakeholder Consultation

The Local stakeholder consultations were conducted by the PP in accordance with the requirements of VCS. The Local Stakeholder meeting was conducted physically on the 06th of June 2022 at the Kolping Hotel Kampala. The stakeholders were invited from the various categories including the experts of climate change, cookstoves, consultants, NGOs including the potential users.

During the meeting, PP has given the brief introduction of the project activity and explained the social, environmental and economic benefits of the project. The participants enquired regarding the benefits related to sustainability of the project, trainings, subsidy on ICS, production capacity, employment generation and uses of the ICS. The audit team has checked the stakeholder related documentation-invitations, summary provided to participants and feedback by the local community/21/. For the verification stage, the VVB has also conducted interviews with some of the stakeholders during the on-site visit and confirmed on the local stakeholder consultation meeting. No negative comment was received.

PP has maintained a register as a part of on-going communication with local stakeholders and end users are informed about grievance register. PP shall encourage the stakeholders to provide feedback/grievance as part of continuous ongoing stakeholder communication. The stakeholders shall be communicated through the house visits. The project proponent/local partners have the responsibility to take grievances regarding the project activity and same will be taken into account during operation of project activity. Thus ongoing communication of stakeholders is followed through grievance mechanism. The audit team has checked the grievance register and no grievances have been reported during the first monitoring period of the project instance. The VVB confirms that the local stakeholder consultations have been done in accordance with VCS Standard, v4.3 requirements/4/.

3.3.3 Environmental Impact

The project does not have any negative environmental impact and does not require any specific license/approval from host country. The project has positive environmental impacts as discussed below:

- The project being the implementation of improved cooking stoves saves energy which leads to overall emission reductions. The energy supply is not hampered compared to baseline but improved.
- The project involves use of improved cook stoves which does not need any water for its operation. Therefore, the project does not have any impact on water.
- The project involves use of improved cook stoves which does not involve any landscape modification or leads to vulnerable natural disasters. It also does not involve any manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials. It leads to less pollution (air pollution due to firing of firewood) compared to baseline scenario as the project technology itself is saving firewood consumption compared to baseline scenario.

No potential negative environmental or socio-economic impacts have been identified for the project activity.

3.3.4 Public Comments

This project was open for public comment from 22/07/2022 to 21/08/2022/10/. No comment found raised during public commenting period.

3.3.5 AFOLU-Specific Safeguards

The project is a non-AFOLU project. Hence, this section is not required.

3.4 Application of Methodology

3.4.1 Title and Reference

Methodology Title: VMR0006- Methodology for Installation of High Efficiency Firewood Cookstoves, Version: 1.1/5/

Sectoral Scope: 03

Type: Type II – Energy Efficiency Improved Projects

Methodological tool: “TOOL30: Calculation of the fraction of non-renewable biomass”; Version-03, EB 108, Annex 11 /8/

The methodology is valid at the time of joint validation and verification of the project activity have been checked and confirmed by the assessment team.

3.4.2 Applicability

The project activity applies VCS methodology; VMR0006, Version 1.1. The validity of methodology is from 22/07/2021. The applicability criteria for the methodology are assessed by the audit team by means of document review and interviews. The audit team confirms that the project activity meets the criteria of the applied methodology.

S. No.	VMR0006, Version 1.1 Requirements/5/	Project activity applicability	Means of verification
1	Project activities must introduce efficiency improvements in thermal applications of non-	The project activity instances are ICS designed to be used for cooking in	The proposed project instances are implemented in households in the domestic premises, where efficiency improvements in thermal applications of

	renewable biomass in the following premises: households, community-based kitchens., institutions (e.g., schools) or small and medium-sized enterprises (SMEs)".	domestic premises, or in community-based kitchens. PP would like to clarify that all the ICS under the group project shall be distributed to households, community-based kitchens., institutions (e.g., schools) or small and medium-sized enterprises (SMEs) only. The evidence of the same for the distributed ICS till this verification have been furnished to VVB and it can be evidenced that all users are HHs.	non-renewable biomass is introduced. The same has been checked by the audit team from the user agreements and confirmed at the time of site visit.
2	The project stove shall have specified high-power thermal efficiency of at least 25% per the manufacturer's specifications and shall exclusively use woody biomass and can be single pot or multi-pot; in case of project stove replacing fossil fuel baseline stove, it shall exclusively use renewable biomass.	The manufacturer's specifications shall indicate the thermal efficiency of each ICS. Only ICS' with a high-power thermal efficiency of at least 25%, and exclusively fuelled by renewable biomass. The first ICS-models to be distributed under the project activity are following: 1. Burn Kuniokoa (wood fired stove) 2. Burn Jikokoa (charcoal fired stove) 3. Masupa size II (charcoal fired Stove)	The efficiency/16/ of ICS distributed are as follows: Burn Jikokoa stove: 53.7% Masupa stove: 38.2% Kuniokoa stove: 42.4% The efficiency is based on the lab test reports, which has been checked by the audit team. Hence the efficiency of ICS is more than 25% and hence meet the methodological requirements.
3	Both 'Projects' and 'Large Projects' can use this methodology.	The Project is of 'Large Project' scale	Since the estimated emission reductions are more than 300,000 tCO ₂ e/year, hence it falls under the category of Large scale.

4	Non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics⁵.	In 1985, more than 90% of total non-commercial energy demand in Uganda was met through fuelwood and charcoal¹. There has not been significant change in the non-commercial energy scenario since 1980 and the majority of household energy demand was met through charcoal and fuelwood even in year most recent years (2019) in Uganda. According to Uganda-Wood Fuel Overview by Waves published in June 2019², total demand of wood fuel in Uganda was 53.1 million MT and wood fuels accounts 88% of all energy need in Uganda. The bulk of wood fuels (87% in fuelwood equivalent) are consumed by households, while industry and the commercial sector account for the balance (UBOS, 2018) It can therefore be concluded that non-renewable biomass has been used in Uganda since long back before 31st December 1989	Non-renewable biomass has been in use since 31st December 1989 as evidenced by various FAO statistical data/36/. The Global Forest Resources Assessment 2010 (FAO) indicates that forest areas decline yearly. Between years 1990 and 2010, Uganda lost on average of 88,200 hectares of forest per year. This amounts to an average annual deforestation rate of 1.86%. Between years 2000 and 2010, the rate of forest loss is 22.8% or 2.28% per annum. In total, between 1990 and 2010, Uganda lost 37.1% of its forest cover, or around 1,763,000 hectares. <table><tr><th rowspan="2">FRA 2010 categories</th><th colspan="4">Area (1000 hectares)</th></tr><tr><th>1990</th><th>2000</th><th>2005</th><th>2010</th></tr><tr><td>Forest</td><td>4 751</td><td>3 869</td><td>3 429</td><td>2 988</td></tr><tr><td>Other wooded land</td><td>1 370</td><td>2 377</td><td>2 880</td><td>3 383</td></tr><tr><td>Other land</td><td>13 589</td><td>13 464</td><td>13 401</td><td>13 339</td></tr><tr><td>...of which with tree cover</td><td>n/a</td><td>n/a</td><td>n/a</td><td>n/a</td></tr><tr><td>Inland water bodies</td><td>4 394</td><td>4 394</td><td>4 394</td><td>4 394</td></tr><tr><td>TOTAL</td><td>24 104</td><td>24 104</td><td>24 104</td><td>24 104</td></tr></table> The non-commercial energy demand in Uganda was met through fuelwood and charcoal, since year 1985. The same has been confirmed through the assessment reports. Further in the most recent years 2019, the majority of household energy demand was met through charcoal and fuelwood in Uganda The criteria have been checked based on publicly available literature and reports. Thus, it can be concluded that losses have been reported in forest areas from before 1989 thereby hinting that fuelwood used across Uganda comes from non-renewable sources. It can therefore be concluded that non-renewable biomass has been used in	FRA 2010 categories	Area (1000 hectares)				1990	2000	2005	2010	Forest	4 751	3 869	3 429	2 988	Other wooded land	1 370	2 377	2 880	3 383	Other land	13 589	13 464	13 401	13 339	...of which with tree cover	n/a	n/a	n/a	n/a	Inland water bodies	4 394	4 394	4 394	4 394	TOTAL	24 104	24 104	24 104	24 104
FRA 2010 categories	Area (1000 hectares)																																									
	1990	2000	2005	2010																																						
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TOTAL	24 104	24 104	24 104	24 104																																						

¹ https://eprints.utas.edu.au/20247/1/whole_KahangireBatuuraine1985_thesis.pdf

² <https://www.wavespartnership.org/sites/waves/files/kc/WAVES-Woodfuel%20Overview%20Technical%20Report%20Design%20Layout%20Final%20-October.pdf>

			Uganda since long back before 31 st December 1989.
5	For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips), it shall be demonstrated that: (a) It is produced using exclusively renewable biomass (more than one type of biomass may be used). (b) The consumption of the fuel should be monitored during the crediting period and (c) Energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of the displaced fossil fuel and hence disregarded.	This is not applicable as no processed biomass will be used under this group project activity.	As no processed biomass will be used under this grouped project activity, hence this criteria is not applicable.
Additionally, applicability criteria numbers 8 and 9 set out in Section 2.2 of AMS II.G, version 11.1, later reflected under para 7 and 8 of AMS II.G, version 12 are demonstrated as below:			
6	The Project Description shall explain the proposed method for distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations (e.g. programme logo).	Each ICS shall be allocated a unique serial number. These Sr numbers are captured in a central master database together with the end users/ beneficiaries' details characteristics such as the address of the end user, date of distribution of ICS and their contact details as much as possible, results from surveys, etc. This record keeping system will ensure that each ICS can be	Each of the distributed project ICS has a unique serial number, which has been checked from the project database/19/ and the end-user agreements/13/. Further the unique serial number in each of the ICS was confirmed during the site visit. Hence the sufficient provision and method to avoid double counting of emission reductions in the project activity are in place and hence found correct.

		traced and double counting can be avoided.	
7	The Project Description shall also explain how the proposed procedures prevent double counting of emission reductions, for example to avoid that project stove manufacturers, wholesale providers or others claim credit for emission reductions from the project devices.	Stove manufacturers, wholesale providers and any other entity involved with the manufacturing, sale and/or distribution of the ICS shall enter into a contractual agreement with the PP that the ICS' under the Project are not included in any other GHG reduction certification scheme. The PP shall continuously monitor other developments of ICS distribution schemes in the region and shall perform regular cross-checks to ensure itself that any new projects/programmes are not including the ICS' under the proposed Project.	PP has sufficiently explained on the procedures in place that explain how the double counting of emission reductions are prevented in the project activity, which is found correct. The same is verified from the distribution records/19/, ICS database/19/, carbon waiver records/13/ and confirmed at the time of site visit.
8	Tool 30: Calculation of the fraction of non-renewable biomass, may be used by: (a) DNAs to submit region- or country-specific default f_{NRB} values, following the procedures for development, revision, clarification and update of standardized baselines (SB procedures); or (b) project participants to calculate project- or PoA-specific f_{NRB} values.	Option (b) applied to calculate the project specific f_{NRB} value as described under section 4.1 of the PD.	The option (b) has been applied to calculate the project specific f_{NRB} value as described under section 4.1 of the joint PD & MR & ERs Excelsheet, which is found corrected.

3.4.3 Project Boundary

As given in the applied methodology VMR0006, ver1.1/5/, project boundary must be determined following CDM methodology AMS II.G, therefore the project boundary is defined as:

“The project boundary is the physical, geographical site of the efficient devices that utilize biomass”. The information regarding the project boundary has been correctly provided in the joint PD & MR. The project boundary includes the improved cookstove within Uganda. Therefore, the entire Uganda have been considered in the project boundary for the proposed VCS project activity. The project ICS installation location is verified from installation database and end-user agreements.

The assessment team confirms that the project boundary for the project instances is based on the applied methodology. The project boundary includes emissions from use of non-renewable biomass from baseline and project cook stoves. The details of this boundary have been checked from the ICS receipts and all related project documentation. The CO₂, CH₄ and N₂O are the major source of GHGs and the same has been assessed by the audit team. This is in line with Table 1 of methodology and found to be appropriate. The emission reductions are calculated as per equation (1) of methodology which consider the CO₂ emission factor and non-CO₂ emission factor. The project boundary was also confirmed at the time of site visit.

3.4.4 Baseline Scenario

The baseline scenario has been identified as per the requirements of the applied methodology. As per the applied methodology, “The baseline scenario is the continued use of non-renewable wood fuel (firewood/charcoal) or fossil fuel (coal/kerosene) by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity”. PP has been able to demonstrate that non-renewable biomass is the baseline fuel used in conventional cooking stoves. Majority of households in the project districts use non-renewable biomass to meet their cooking needs.

The existing traditional stoves used in the baseline are simple structures made from clay or having stone or metal tripods with poor combustion air supply or flue gas ventilation system i.e. without a grate or a chimney. These stoves use non-renewable biomass.

The non-renewable biomass is the most used source of domestic energy in Uganda’s households. The impact on remaining forest cover in these countries is significant due to high deforestation rates that arise in order to meet energy needs of the growing population. Traditionally, open fire utilizing the “three stone” method is the most prevalent method for cooking in rural areas. This method is quite inefficient and leads to the unsustainable usage of non-renewable biomass in the cooking process. The replacement of the traditional “three-stone” fire method with the new efficient stoves will lead to substantial reduction of biomass usage.

As per analyses in the Africa Energy Outlook 2019/22/, the lack of access to clean cooking remains widespread in sub-Sahara Africa with access increasing only slightly from 15% in 2015 to 17% in 2018. Since 2015, only 25 million people have gained access to clean cooking in the region, meaning that the number of people without access increased to over 900 million in 2018 as population growth outpaced provision efforts. Sub-Sahara Africa is the only region where the number of those without access to clean cooking practices continues to rise,

highlighting the urgent need for action. As a result, the vast majority of people in sub-Sahara Africa rely on gathering biomass for cooking.

Uganda is facing rapid deforestation, rate of which is increasing consistently over past decades. The Global Forest Resources Assessment 2010 (FAO)/36/ indicates that forest areas decline yearly. Between years 1990 and 2010, Uganda lost on average of 88,200 hectares of forest per year. This amounts to an average annual deforestation rate of 1.86%. Between years 2000 and 2010, the rate of forest loss is 22.8% or 2.28% per annum. In total, between 1990 and 2010, Uganda lost 37.1% of its forest cover, or around 1,763,000 hectares.

FRA 2010 categories	Area (1000 hectares)			
	1990	2000	2005	2010
Forest	4 751	3 869	3 429	2 988
Other wooded land	1 370	2 377	2 880	3 383
Other land	13 589	13 464	13 401	13 339
...of which with tree cover	n/a	n/a	n/a	n/a
Inland water bodies	4 394	4 394	4 394	4 394
TOTAL	24 104	24 104	24 104	24 104

The non-commercial energy demand in Uganda was met through fuelwood and charcoal, since year 1985. The same has been confirmed through the assessment reports. Further in the most recent years 2019, the majority of household energy demand was met through charcoal and fuelwood in Uganda. Thus, it can be concluded that losses have been reported in forest areas from before 1989 thereby hinting that fuelwood used across Uganda comes from non-renewable sources. Hence the non-renewable biomass is the most commonly source of fuel in the traditional stoves.

Forest degradation, sometimes leading to deforestation, is another serious consequence of the unsustainable harvesting of fuelwood. Fuelwood from forests and/or other natural areas (e.g., woodlands) containing these resources, requires traditional cooking methods. These traditional cooking devices are referred to as “3 stones”, “triangle iron”, and/or “crude clay-” or “mud- constructions”. Burning fuelwood in such traditional devices is representative for the scenario existing prior to the implementation of the proposed Project.

As per information available in public domain/26/27/the penetration level of ICS is very low in host country Uganda and 80% population is still using the inefficient firewood cooking practices.

The validation team during the on-site interview found that users are dependent on fire-wood based conventional cooking system. Therefore, the baseline scenario is identified transparently for the project activity. There is no national or local policy/law that mandates to use ICS or prohibit to use conventional cooking devices. Therefore, the baseline identified by project proponent meets national policy.

Further the it is evident from the data provided by project proponent and other publicly available data, the conventional cooking system with firewood is the most economically viable option for users over other available sources such as ICS. The identified baseline requires no cost or very minimal cost compared to the other options. Therefore, baseline scenario is identified correctly by the project proponent.

Hence in the absence of the project activity, the intended beneficiaries of the project would continue using the traditional inefficient cooking stoves, consuming high quantity of non-renewable biomass (including charcoal).

Thus, the baseline scenario has been identified in line with the requirements of the applied methodology VMR0006, Version 1.1 and is deemed to be appropriate and justified.

3.4.5 Additionality

The PP has demonstrated the additionality in line with methodology requirement as below.

The PP uses activity method for the demonstration of additionality.

Activity Method

Step 1: Regulatory Surplus

There is no mandated government programme or policy in host country of this project ensuring the distribution of domestic fuel-efficient cookstoves. The project is not mandated by any law, statute or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute or other regulatory framework. The assessment team has been checked through search of any laws which are mandated to install ICS in Uganda and found that there are no any such mandated laws for implementation of project activity. A review is made on Uganda environmental laws and regulations/23/33/34/has been carried and found that there is no mandatory legal requirement for installation of cookstoves in households/ institutions of Uganda. Further the following rules/regulations have also referred:

- a) The National Environment Act, 2019/43/
- b) The National Environmental (Audit) Regulations, 2020/44/
- c) The National Environment (Environmental and Social Assessment) Regulations, 2020/45/
- d) National Environment Action Plan (NEAP) and National Environment Management Policy (NEMP) of 1994/46/
- e) National Forestry and Tree Planting Act (hereafter Forest Act), Laws of Uganda (Uganda Law Reform Commission)/47/
- f) The 1995 Constitution of Uganda/48/
- g) The National Environment Act,1995/49/

Hence there is no mandatory legal requirement for installation of improved cookstoves in households/institutions of Uganda.

Also PP, manufacturer, distributor and household owners are interviewed during audit and confirmed that this project activity is voluntary and not mandated by any laws.

Households may only participate voluntarily in this project. It is hereby confirmed that the proposed project is a voluntary coordinated action by project proponent. This has been assessed by the project ownership and undertaking documents.

Step 2: Positive List

Criteria:

The applicability conditions of this methodology represent the positive list. The project must demonstrate that it meets all the applicability conditions of the methodology as well as the below condition. In so doing, the project is deemed as complying with the positive list.

1. Where the project activity installs or distributes stoves at zero cost to the end-user and has no other source of revenue other than the sale of GHG credits, the project activity shall be deemed additional.

Justification: The project is being distributed at highly subsidized cost to the end-user. Please refer below substantiation. Hence this condition is not applicable.

2. Project activities that are implemented as part of government schemes or are supported by multilateral funds cannot be considered additional even if the stoves are distributed free of cost or at a highly subsidized rate and hence are not eligible to use this methodology.

Justification: The project activity is voluntary activity and is not part of any government scheme therefore the criteria met. The ICS are sold for a price to the end-users. Hence the PP has used the project method too to demonstrate the additionality of project below.

Step 3: Project Method

The “Tool for demonstration and assessment of additionality” Version-7.0.0 (EB 70 Annex-08)/8/ has been applied to demonstrate the additionality

The Tool provides for a step-wise approach to demonstrate and assess additionality. These steps include:

Step 0 - Demonstration whether the proposed project activity is the first-of-its-kind

Step 1 - Identification of alternatives to the project activity consistent with current laws and Regulations

Step 2 - Investment analysis

Step 3 - Barrier analysis

Step 4: Common practice analysis

Step 0- Demonstration whether the proposed project activity is the first-of-its-kind

The proposed project activity is not first of its kind in host country.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity:

The project activity is to distribute improved cookstove to individual households to replace the traditional stoves, the alternatives to the project activity are

- a) The proposed project activity undertaken without being registered as a VCS project activity.
- b) Continuation of the current situation.

Outcome of Step 1a: Identified realistic and credible alternative scenario(s) to the project activity. The alternative identified are as follows:

- (a) The proposed project activity undertaken without being registered as a VCS project activity;

(c) Continuation of the current situation wherein the 94% population is using the non-renewable biomass for cooking /27/. As per the research paper (page 3)/27/, “94% Ugandan households that primarily depend on biomass, 73% use firewood while 21% use charcoal for cooking, electricity (1.4%), kerosene (0.6%), and other sources including LPG, bio-fuels account for 3.9% (UBOS, 2021)”. Hence it is demonstrated that 90% users uses in the inefficient cooking practices in the baseline scenario.

Sub-step 1b: Consistency with mandatory laws and regulations:

There are no policies in host country to regulate fuel usage for cooking at household level and both the alternative identified above are found to be in compliance in host country rule and regulations. The following rules/regulations have been referred:

- a) The National Environment Act, 2019/43/
- b) The National Environmental (Audit) Regulations, 2020/44/
- c) The National Environment (Environmental and Social Assessment) Regulations, 2020/45/
- d) National Environment Action Plan (NEAP) and National Environment Management Policy (NEMP) of 1994/46/
- e) National Forestry and Tree Planting Act (hereafter Forest Act), Laws of Uganda (Uganda Law Reform Commission)/47/
- f) The 1995 Constitution of Uganda/48/
- g) The National Environment Act, 1995/49/

Hence there is no mandatory legal requirement to regulate fuel usage for cooking at household level.

Outcome of Step 1b: Identified realistic and credible alternative scenario(s) to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

Both the alternative identified above are found to be in compliance with host country regulation.

Step 2: Investment analysis

In order to conduct the investment analysis, the following sub-steps has been followed:

Sub-step 2a: Determine appropriate analysis method

As the project proponent will sale ICS at a lower price than purchase cost of ICS and there is no other economic benefit than sale of VCUs, hence a simple cost analysis is chosen by PP, which is found appropriate. Hence it can be confirmed that the project is not generating any profit as it is clearly demonstrated in the following step and making loss without the carbon revenue.

Sub-step 2b: Option I. Apply simple cost analysis

The proposed project intends to distribute the ICS at reasonable subsidy to users i.e., households; hence financial return from the programme will be less than cost incurred, further the project proponent will hire a team for supply chain and maintenance and repair. As each ICS has certain costs associated with the production/purchase, distribution, monitoring and verification etc., the programme will not occur in absence of the carbon revenue. The action is not financially viable without the support of revenues from the sale of VCUs. As the end-user does not benefit from a direct financial return and procuring ICSs requires capital, which is a barrier to rural/semi-urban consumers due to difficulties in accessing capital, a wide dissemination of ICSs in

the host country is unlikely. The actions under the project will alleviate these barriers by promoting distribution of ICSs to end-users at an affordable price. Hence, the project faces investment barrier and hence been considered to be additional. The simple cost analysis is substantiated below:

Actual Cost of Purchase/Sale of ICS			Subsidized	Sale	to	Actual Cost of Purchase/Sale of ICS - Subsidized Sale to Households		
Model	Cost of Purchase \$US/ICS	Distribution Cost \$	Model	Price to end-user \$US/ICS		Loss, without Carbon Revenue		
Masupa	4.5	1.5.2-5	Masupa	2.6		Model	\$US/ICS	
Burn Jikokoa	28	1.5.2-5	Burn Jikokoa	19.00		Masupa	3.9	
Kuniokoa	26	1.5.2-5	Kuniokoa	19.00		Burn Jikokoa	11.00	
						Kuniokoa	09.00	

The cost of purchase has been checked through the Invoices/14/ from stove manufacturer to the project proponent/local partner and Purchase Order/14/ from project proponent/local partner to stove manufacturer. Similarly the cost of sale is verified through the sale receipts from the EzyLife (local partner) to the end-users. Hence in all the type of ICS, there is a loss to the project proponent/local partner, while selling the stoves to the end-user. Hence it is evident from the above analysis that the project is not financially attractive without the carbon revenue and hence may be considered as additional.

Step 3: Barrier analysis:

Not chosen by PP.

Step 4: Common Practice Analysis:

As per information available in public domain, the penetration level of ICS is very low in host country Uganda and 80% population is still using the inefficient firewood cooking practices and project activity is not a common practice.

As per analyses in the Africa Energy Outlook 2019/22/, the lack of access to clean cooking remains widespread in sub-sahara Africa with access increasing only slightly from 15% in 2015 to 17% in 2018. Since 2015, only 25 million people have gained access to clean cooking in the region, meaning that the number of people without access increased to over 900 million in 2018 as population growth outpaced provision efforts. Sub-Saharan Africa is the only region where the number of those without access to clean cooking practices continues to rise.

The non-renewable biomass is the most used source of domestic energy in Uganda's households. The impact on remaining forest cover in these countries is significant due to high deforestation rates that arise in order to meet energy needs of the growing population. Traditionally, open fire utilizing the "three stone" method is the most prevalent method for cooking in rural areas. This method is quite inefficient and leads to the unsustainable usage of non-renewable biomass in the cooking process.

The validation team during the on-site interview found that users are dependent on fire-wood based conventional cooking system (inefficient cooking). Further the it is evident from the data provided by project proponent and other publicly available data, the conventional cooking system with firewood is the most economically viable

option for users over other available sources such as ICS. Since the conventional inefficient cooking requires no cost or very minimal cost compared to the other options. Hence this remains a common practice and the ICS stoves does not fall under the category of common practice.

Forest degradation, sometimes leading to deforestation, is another serious consequence of the unsustainable harvesting of fuelwood. Fuelwood from forests and/or other natural areas (e.g., woodlands) containing these resources, requires traditional cooking methods. These traditional cooking devices are referred to as “3 stones”, “triangle iron”, and/or “crude clay-” or “mud- constructions”. Burning fuelwood in such traditional devices is representative for the scenario existing prior to the implementation of the proposed Project.

The validation team during the on-site interview found that users are dependent on fire-wood based conventional cooking system. There is no national or local policy/law that mandates to use ICS or prohibit to use conventional cooking devices. Further the it is evident from the data provided by project proponent and other publicly available data, the conventional cooking system with firewood is the most economically viable option for users over other available sources such as ICS. The conventional cooking system requires no cost or very minimal cost compared to the other options. Hence the ICS is not a common practice in the country of Uganda.

3.4.6 Quantification of GHG Emission Reductions and Removals

The equations and choices provided in the applied methodology VMR0006, version 1.1 is correctly quoted in the joint PD & MR. The emission reductions of the project would be calculated using the formulae mentioned in the applied methodology.

The audit team based on the review of the joint PD & MR confirms that the formulae are correctly presented for the determination of emissions reductions. The parameters and equations presented in the joint PD & MR, as well as other applicable documents, have been compared with the information and requirements presented in the applied methodology. An equation comparison has also been made to ensure consistency between all the formulae presented in the joint PD & MR and ERs Excel spreadsheet and the applied methodology.

The improved cookstove is introduced as energy efficiency measure in the project, therefore equations 1 and 2 of the methodology will be applied to calculate the net GHG emission reductions.

$$ER_y = \sum_i \sum_j ER_{y,i,j} \quad \text{Equation (1)}$$

Where:

- i = Indices for the situation where more than one type/model of improved cookstove is introduced to replace three-stone fire
- j = Indices for the situation where there is more than one batch of improved cookstove of type i
- ER_y = Emission reductions during year y in t CO₂e
- ER_{y,i,j} = Emission reductions by improved cookstove of type i and batch j during year y in t CO₂e

$$ER_{y,i,j} = B_{y,savings,i,j} \times NCV_{wood\ fuel} \times f_{NRB,y} \times (EF_{wf,CO_2} + EF_{wf,non\ CO_2}) \times N_{y,i,j} \times 0.95 \quad \text{Equation (2)}$$

where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved in tonnes per improved cookstove of type i and batch j during year y
$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass (f_{NRB})
$NCV_{wood\ fuel}$	=	Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne)/28/
EF_{wf,CO_2}	=	CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO ₂ /TJ)/28/
$EF_{wf,non\ CO_2}$	=	Non-CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO ₂ /TJ)/28/
$N_{y,i,j}$	=	Number of improved cookstoves of type i and batch j operating during year y
0.95	=	Discount factor to account for leakage

To calculate $B_{y,savings}$, the Option 1 of the applied methodology has been used

$$B_{y,savings,i,j} = B_{old} \times \left(1 - \frac{\eta_{old}}{\eta_{new,i,j}}\right)$$

Where:

B_{old}	Quantity of wood fuel used in the absence of the project activity in tonnes
η_{old}	A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e., without a grate or a chimney.
$\eta_{new,i,j}$	Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.

As some of the project households continue to use baseline cookstoves along with improved cookstoves, B_{old} has been adjusted ex-post based on the percentage of project households found to continue such practice according to the Equation 6 of applied methodology as follows:

$$B_{old,adjusted} = B_{old} \times (1 - \mu_y)$$

Where:

- $B_{old,adjusted}$ = Adjusted B_{old} to account the ex-post usage of firewood in baseline cookstove(s) by project households in addition to improved cookstove (in tonnes per device)
- μ_y = Baseline stove usage factor to account for use of baseline cookstoves along with improved cookstoves.

Based on the above equations, the following ex-ante Emission Reductions was obtained.

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e) ³	Estimated net GHG emission reductions or removals (tCO ₂ e)
2021-22	91,579	0	0	91,579
2022-23	364,750	0	0	364,750
2023-24	363,168	0	0	363,168
2024-25	361,569	0	0	361,569
2025-26	359,954	0	0	359,954
2026-27	358,323	0	0	358,323
2027-28	356,675	0	0	356,675
2028-29	364,750	0	0	364,750
2029-30	361,569	0	0	361,569
2030-31	359,954	0	0	359,954
Total	3,342,291	0	0	3,342,291

The emission reductions estimation can be replicated using the data and parameter values provided in the joint VCS PD & MR and supporting file submitted for registration/issuance. The data sources mentioned have been verified by the audit team. 4KES confirms that the estimates provided in the joint VCS PD & MR are reasonable and the project participant has correctly applied the methodology; the calculations are complete and transparent and the data accuracy has been verified.

3.4.7 Methodology Deviations

The deviation has been sought with respect to the approach chosen for determining the efficiency of the baseline charcoal cookstoves. There are two options (default value or surveys prior to implementation of project activity)

³ 5% leakage is already deducted and considered in the baseline calculation as per the methodology.

to determine the efficiency of baseline stoves as per the applied methodology. PP has chosen the ‘surveys’ option to determine the efficiency of baseline stoves. However for determining the charcoal baseline efficiency, the survey was not possible before the project implementation due to the peak COVID-19 scenario existing prior to the implementation, hence PP undertook the baseline survey along-with the first monitoring survey. During the surveys, it was found that the HHs were using the traditional charcoal stoves in baseline without the chimney or grate. The same also confirmed during through the site visit. The efficiency of baseline stove was sourced from the research paper *“Development of bioenergy technologies in Uganda: A review of progress under section 2.1.1”/32/* as per which *“traditional charcoal stoves, on the other hand, are locally made using scrap metal materials such as roofing sheets and oil drums, but do not have insulation lining; therefore, leading to excessive heat loss during operation. The efficiency of these stoves is reported to be less than 10%”*. However PP has conservatively considered the efficiency of 15% for charcoal cookstoves, which is found conservative and hence the deviation was accepted.

3.4.8 Monitoring Plan

The monitoring plan meets the requirements stipulated in applied methodology “VMR0006- Methodology for Installation of High Efficiency Firewood Cookstoves Version: 1.1” and “general guidelines for SSC CDM methodologies”. Below tables describe applicable parameters to be monitored ex-post:

Data and parameters monitored ex-post:

Data/parameter	Unit	Value applied	Assessment
N _{y,i,j} (Number of project devices of type I and batch j operating during year y)	Number	50,000 (for ex-ante emission reduction calculation, it is estimated that the project will distribute up to 50,000 ICS in phased manner) 14,088 stoves distributed in the monitoring period, however some of the households have more than 1 stove distributed. Hence the	The parameter is determined with the help of representative sampling (monitoring surveys). The sample size shall be determined to achieve 95/10 confidence precision according to the latest version of Standard for sampling and surveys for CDM project activities and programme of activities/7/ for biennial survey and 90/10 for annual survey. The proportion of operational stoves obtained from the survey will be multiplied by the total commissioned stoves to arrive at the number of operational stoves. For the ex-ante purpose, 100% of the planned stoves (50,000 ICS in phased manner) have been considered for the emission reduction calculations. The project plans to distribute 12,500 ICS during Phase-1 (year-1) and 37,500 ICS during Phase-2 (year-2), which was also confirmed during the interviews. The age of each ICS has been calculated separately at the end of monitoring period since the date of distribution/purchase is not same for each ICS. Subsequently the average age is calculated which

		discounted number of 11,936 stoves are considered in the ex-post emission reduction calculations.	account the actual number of days/year crediting of each stove in the monitoring period. Hence although the ERs are claimed from the start date of crediting period (02/01/2021), but only the ICS which has been distributed on 02/01/2021 will claim from date, rest all ICSs will claim the ERs from the date of distribution, which is found logical, hence acceptable. The monitoring plan for the parameter is found appropriate (as per measurement methods and procedures to be applied) and inline with the applied methodology. The monitoring results will be recorded consistently as per the approved frequency in the monitoring plan. During the site visit, it was confirmed that the necessary QA/QC procedures are in place and the data management is effective and reliable. For the monitoring period, PP has randomly selected the ICS applying random sampling function in excel and accordingly the target ICS sample is determined for survey. The sample size has been determined following confidence/precision of 95/10 and total sample size arrived as 33 samples. However the PP chose additional 28 samples and in total 61 samples were surveyed during the monitoring surveys. Questionnaire survey form used by the surveyor and the survey results have been provided and checked. During the monitoring surveys, all the 61 selected samples were found to be operating. Hence it was concluded that the total number of operating stoves during the monitoring period were 14,088 stoves. However some of the households have more than 1 distributed households and hence the discounted 11,936 ICS have only been used in the emission reduction calculations, which is found conservative and appropriate. The monitoring surveys and the emission reductions excelsheet has been checked and found correct. Further the parameter has been checked through the acceptance sampling conducted during the site visit. The VVB conducted the acceptance sampling to check the monitoring surveys results. Verification team has
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			determined acceptance sample size for the sample survey parameter based on the Table-2 and guidance provided under para 28-33 of standard “Sampling and surveys for CDM project activities and programmes of activities” version 9/7/. During the on-site visit a sampling approach has been used by the audit team to verify the reported values for the monitored parameters in the joint PD & MR. The sampling approach included households which have been included in the monitoring survey by the CME. Accordingly, the audit team verified a total of 11 Samples as per the details provided in Section 2.3 above and observed that the sampling survey results of the PP for all the checked HHs were found to be correct and hence acceptable. Thus the results of the monitoring parameter as available in the joint PD & MR were confirmed and found correct inline with the applied methodology.
Date of commissioning of batch j	Date	02/01/2021 (the first cookstove distributed under batch 1)	The date of commissioning of the ICS is fixed and recorded at the time of commissioning/distribution of the ICS. The installation records/19/ have been checked and found that it has adequate provision to record the date of commissioning of the project ICS. During the site visit, it was confirmed that the necessary QA/QC procedures are in place and the data management is effective and reliable. The first ICS distributed under the batch 1 was on 02/01/2021/19/, which was confirmed based on the purchase receipt of the ICS and hence found correct. For the monitoring period, the date of commissioning of sample ICS have been checked through the acceptance sampling conducted during the site visit. Verification team has determined acceptance sample size for the parameter based on the Table-2 and guidance provided under para 28-33 of standard “Sampling and surveys for CDM project activities and programmes of activities” version 9. The sampling approach included households which have been included in the monitoring survey by the CME. Accordingly, the audit team verified a total of 11 samples

			as per the details provided in Section 2.3 above and observed that the commissioning dates of the stoves in HHs were found to be correct and hence acceptable. The installation records have been checked and found that it has the commissioning dates of the installed ICS, and the provision is found to be inline with the applied methodology.
μ_y (Adjustment to account for any continued use of pre-project devices during the year y)	Fraction	1.0 (for the ex-ante emission reductions) 1.0 (for the Masupa stoves determined for the monitoring period) 0.9711 (for the BURN Jikokoa stoves determined for the monitoring period) 1.0 (for the Kunikoa stoves determined for the monitoring period)	The parameter is determined with the help of representative sampling (monitoring surveys). The sample size shall be determined to achieve 95/10 confidence precision according to the latest version of Standard for sampling and surveys for CDM project activities and programme of activities irrespective of annual/biennial survey. In the case the desired precision is not met, lower bound values shall be used against repeating the survey to determine the operational fraction of stoves. For the ex-ante purpose, 1.0 have been considered for the emission reduction calculations. The monitoring plan for the parameter is found appropriate (as per measurement methods and procedures to be applied) and inline with the applied methodology. The monitoring results will be recorded consistently as per the approved frequency in the monitoring plan. During the site visit, it was confirmed that the necessary QA/QC procedures are in place and the data management is effective and reliable. For the monitoring period, PP has randomly selected the ICS applying random sampling function in excel and accordingly the target ICS sample is determined for survey. The sample size has been determined following confidence/precision of 95/10 and total sample size arrived as 33 samples. However the PP chose additional 28 samples and in total 61 samples were surveyed during the monitoring surveys. Questionnaire survey form used by the surveyor and the survey results have been provided and checked. During the monitoring surveys, the following results were obtained:

			- 1.0 (for the Masupa stoves determined for the monitoring period) - 0.9711 (for the BURN Jikokoa stoves determined for the monitoring period) - 1.0 (for the Kunikoa stoves determined for the monitoring period) The monitoring surveys and the emission reductions excelsheet/2/ has been checked and found correct. Further the parameter has been checked through the acceptance sampling conducted during the site visit. The VVB conducted the acceptance sampling to check the monitoring surveys results. Verification team has determined acceptance sample size for the sample survey parameter based on the Table-2 and guidance provided under para 28-33 of standard "Sampling and surveys for CDM project activities and programmes of activities" version 9/7/. During the on-site visit a sampling approach has been used by the audit team to verify the reported values for the monitored parameter in the joint PD & MR. The sampling approach included households which have been included in the monitoring survey by the CME. Accordingly, the audit team verified a total of 11 Samples as per the details provided in Section 2.3 above and observed that the sampling survey results of the PP for all the checked HHs were found to be correct and hence acceptable. Thus the results of the monitoring parameter as available in the joint PD & MR were confirmed and found correct inline with the applied methodology.
$\eta_{new,i,j}$ (Efficiency of the device of each type i and batch j implemented as part of the project activity)	Fraction	0.537 (initial efficiency for Burn Jikokoa stove) 0.382 (initial efficiency for Masupa stove) 0.424 (initial efficiency for Kuniokoa stove)	The initial efficiency of the stoves have been determined based on the tests reports for each of the ICS types and hence found appropriate. The tests have been conducted by reputed and authentic Labs (CREEC-Centre for research in energy and energy conservation, KIRDI Stove Testing Centre)/16/ and hence found appropriate.

			Further the efficiency of the ICS degrades over the years and the same has been calculated based on the following formula based on the applied methodology: $\eta_{new,i,y} = \eta_p \times (DF_n)^{y-1} \times 0.94$ Thus the yearly efficiency during the subsequent years of the crediting period arrives as follows: <table border="1"> <thead> <tr> <th>Depreciated Efficiencies as per VMR0006</th><th>Burn Jikokoa Model</th><th>Masupa Model</th><th>Kuniokoa Model</th></tr> </thead> <tbody> <tr> <td>Initial ICS efficiency (η_p)</td><td>0.537</td><td>0.382</td><td>0.424</td></tr> <tr> <td>Year End</td><td>Stove efficiency</td><td>Stove efficiency</td><td>Stove efficiency</td></tr> <tr> <td>1</td><td>0.505</td><td>0.359</td><td>0.399</td></tr> <tr> <td>2</td><td>0.500</td><td>0.355</td><td>0.395</td></tr> <tr> <td>3</td><td>0.495</td><td>0.352</td><td>0.391</td></tr> <tr> <td>4</td><td>0.490</td><td>0.348</td><td>0.387</td></tr> <tr> <td>5</td><td>0.485</td><td>0.345</td><td>0.383</td></tr> <tr> <td>6</td><td>0.480</td><td>0.341</td><td>0.379</td></tr> <tr> <td>7</td><td>0.475</td><td>0.338</td><td>0.375</td></tr> </tbody> </table> The calculations for the above efficiencies have been checked based on the calculations submitted in the ERs Excelsheet and found correct. The parameter is monitored appropriately, in accordance with the monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. During the site visit, it was confirmed that the necessary QA/QC procedures are in place and the data management is effective and reliable.	Depreciated Efficiencies as per VMR0006	Burn Jikokoa Model	Masupa Model	Kuniokoa Model	Initial ICS efficiency (η_p)	0.537	0.382	0.424	Year End	Stove efficiency	Stove efficiency	Stove efficiency	1	0.505	0.359	0.399	2	0.500	0.355	0.395	3	0.495	0.352	0.391	4	0.490	0.348	0.387	5	0.485	0.345	0.383	6	0.480	0.341	0.379	7	0.475	0.338	0.375
Depreciated Efficiencies as per VMR0006	Burn Jikokoa Model	Masupa Model	Kuniokoa Model																																								
Initial ICS efficiency (η_p)	0.537	0.382	0.424																																								
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6	0.480	0.341	0.379																																								
7	0.475	0.338	0.375																																								

4KES has checked all the parameters presented in the monitoring plan against the requirements of the methodology; no deviations relevant to the project activity have been found in the plan.

Additionally the project also addresses various SDGs Targets/Indicators as follows:

- SDG 3.9: As the project involves installation of improved cookstoves, hence it leads to a reduction in fuel consumption and as a consequence leads to an improvement in indoor air quality. This has positive impacts on the health-related issues like respiratory problems, eye and throat irritations. The relevant

indicator chosen is “Mortality rate attributed to household and ambient air pollution”. For this current monitoring period, the monitoring survey was undertaken and it was found that all the sampled households confirmed on the smoke reduction and also on less itchy eyes. The VVB also interviewed the households as part of DOE’s acceptance sampling and confirmed that the project leads to the smoke reduction.

- b. SDG 5.4: During the site visit, it was found that women and girls perform the majority of unpaid domestic work and this leaves them with less time to rest, study and realise their economic potential, leaving them in time poverty. In regards to time, women are poorer than men as unpaid domestic duties, such as collecting firewood, must be added to their market productive work, making time much scarcer. Women are widely recognized as principally responsible for natural resource collection. These trends demonstrate that reducing the amount of firewood required by households has the potential to reduce the time poverty of women, because the time burden of collecting firewood, which falls disproportionately on women, will be reduced”. For this current monitoring period, the monitoring survey was undertaken and it was found that all the sampled households confirmed on the time savings (0.83 hours/day on an average) for collecting fuel after purchasing project ICS. The VVB also interviewed the households as part of DOE’s acceptance sampling and confirmed that the project leads to the time savings for collecting fuel after purchasing of smoke reduction.
- c. SDG 7.3: The project involves the distribution of improved cookstoves (ICS) and hence leads to the increase in the adoption rate of efficient cookstoves. Thus energy efficiency is promoted in the households which further leads to the energy savings. For this current monitoring period, the monitoring survey was undertaken and it was found that all the sampled households confirmed on using the ICS and hence energy savings. The VVB also interviewed the households as part of DOE’s acceptance sampling and confirmed that all the households use the ICS purchased by them.
- d. SDG 8.1: As the project involves installation of improved cookstoves, hence it leads to a reduction in fuel consumption and hence less money is now spent on collecting the firewood. For this current monitoring period, the monitoring survey was undertaken and it was found that all the sampled households confirmed on monetary savings (37%), while using the ICS. The VVB also interviewed the households as part of DOE’s acceptance sampling and confirmed that all the households confirmed on the money savings.
- e. SDG 13.3: As the project involves installation of improved cookstoves, hence it leads to a reduction in fuel consumption and hence emission reductions. The emission reductions calculations are already described in other part of this joint validation and verification report. The leads to GHG emission reductions of 147,136 tCO₂.

4KES confirms that the monitoring arrangements described in the monitoring plan are feasible within the project design, and the means of implementation of the monitoring plan are sufficient to ensure the emission reductions achieved by/resulting from the proposed VCS project activity can be reported ex post and verified.

3.5 Non-Permanence Risk Analysis

There is not any risk for the project activity.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

The project has been implemented as per the project description provided in the joint PD&MR. There is no material discrepancies observed between project implementation and project description in the joint PD&MR. The monitoring plan has been found to be completed and implemented at the location where the project is located. The implemented monitoring system was found suitable with respect to the process and schedule for obtaining, recording, compiling and analyzing the monitored data and parameters. No discrepancies between the actual monitoring system, and the monitoring plan set out in the project description and the applied methodology have been found during the site visit.

The project has not participated or been rejected under any other GHG programs since validation or previous verification. Further the project has not received or sought any other form of environmental credits. The GHG emission reductions or removals generated by the project have not been included in any emissions trading program or any other mechanism that includes GHG allowance trading.

Hence it can be concluded based on the review of the project documents and the site visit that project has been implemented as described in the joint VCS joint PD&MR.

4.2 Accuracy of GHG Emission Reduction and Removal Calculations

The accuracy of GHG emission reductions are discussed in section 3.4.6 of this report. The reported results are consistent with survey forms and calculation is correctly done in consistent with the applied methodology.

Sampling Plan:

PP's sampling approach:

Due to the large number of ICS installed under the project, it was not economically feasible to monitor each individual ICS unit installed, therefore, a representative sampling was undertaken as part of grouped project sampling plan. The parameter is determined with the help of representative sampling (monitoring surveys). The sample size is determined to achieve 95/10 confidence precision according to the latest version of Standard for sampling and surveys for CDM project activities and programme of activities for biennial survey and 90/10 for annual survey. For the monitoring period, PP has randomly selected the ICS applying random sampling function in excel and accordingly the target ICS sample is determined for survey following confidence/precision of 95/10.

The objective of the sampling was to obtain an unbiased and reliable estimate of the proportion or mean value of the following parameters over the course of the monitoring period, and with 95/10 confidence/precision. The sampling plan consist of monitoring the following parameters as mentioned below:

S. No.	Monitoring Parameter	Description of Monitoring Parameter
1.	$N_{y,i,j}$	Number of project devices of type i and batch j operating during year y
2.	μ_y	Adjustment to account for any continued use of pre-project devices during the year y

The target population is the total ICS population served under the grouped project (and covered under the monitoring report), and the sampling frame consists of aggregated data of end-users of the ICS as recorded in the project databases.

The sampling was conducted using simple random sampling technique over the sampling frame for each project instance. The ICS in the sampling frame were stratified by ICS model i (woody biomass and charcoal) and batch j (year of installation). The sample size was calculated as per the CDM guidelines/standard. The expected parameter values (mean, standard deviation and proportion) have been determined based on project developer's knowledge and experience as per para 13(b) and 13(c) of the Sampling and surveys for CDM project activities and programmes of activities, Version 09.0. The summary is provided below:

Sampling Constants	Values
Monitoring period start	02-01-2021
Monitoring period end	31-07-2022
Level of Sampling	Across Group Project
Confidence (%) (90 or 95)	95%
Margin of Error (%)	10%
Z value	1.960

The sample size is determined using the following formulas:

$$n \geq \frac{z^2 * N * V}{(N-1) * precision^2 + z^2 * V}$$

Monitoring parameter(s)			
Sampling frame(s)			
Sampling approach			
Sampling Population (i)	Model	Sampling frame size	Expected operational proportion (SoF)

Charcoal Stove	Burn Jikakao		12559	0.95
Wood Stove	Masupa		982	0.95
	Kuniokoa		547	0.95
Estimated SOF (p)				
Estimated Standard Deviation of SOF (SD)				
$V_{SOF} = (SD/p)^2$				
Sample Size required (SOF)				
Sampling Population (Batch)	Model	Sampling frame size	Monitored Sample Size ($n_{i,j,total}$)	Operational Sample ($n_{i,j,operational}$)
Charcoal Stove	Burn Jikakao	12559	28	28
wood Stove	Masupa	982		18
	Kuniokoa	547		15
Reliability Check				
Samples Monitored				61
SoF Measured				1.00
Standard Error of SoF				0.0%
Relative precision (Margin of error)				0.0%
Result				Ok, reliability level met
Lower Bound confidence value				Not applicable
Monitoring parameter(s)		Utilization of Project stoves - μ_y		
Sampling frame(s)		Given stove model population		
Sampling approach		Stratified random sampling across stove models		
Sampling Population (i)		Stove population	Expected value	Calculated Sample Size (n)
Charcoal Stove	Burn Jikakao	12559	0.98	9
wood Stove	Masupa	982	0.95	1
	Kuniokoa	547	0.95	1
Estimated results based sample size determination				
Estimated utilization (p)				0.98

$V_{Utilization} = p(1-p)/p^2$				0.02
Minimum Sample Size required (days of utilization)				9
Monitoring results				
Sampling Population		Sampling frame size	Monitored Sample Size	Monitored Utilization
Charcoal Stove	Burn Jikakao	12559	28	0.97
wood Stove	Masupa	982	18	1.00
	Kuniokoa	547	15	1.00
Reliability Check				
Samples Monitored				61
Utilization Measured				0.97
Standard Error of Utilization				2.82%
Relative precision (Margin of error)				5.67%
Result				Ok, reliability level met
Lower Bound confidence value				Not applicable

As it is clear from the above table that samples have been calculated following the required confidence/precision (95/10) and further the required precision was also met based on the conducted sampling. The sampling details and how the accuracy of each of the monitoring parameters has been ensured are discussed as below:

Data/parameter	Unit	Value applied	Assessment
N _{y,i,j} (Number of project devices of type I and batch j operating during year y)	Number	14,088 stoves distributed in the monitoring period, however some of the households have more than 1 stove distributed. Hence the discounted number of 11,936 stoves are considered in the ex-post emission	The parameter is determined with the help of representative sampling (monitoring surveys). The sample size has been determined to achieve 95/10 confidence precision according to the latest version of Standard for sampling and surveys for CDM project activities and programme of activities. The monitoring plan for the parameter is found appropriate (as per measurement methods and procedures to be applied) and inline with the applied methodology. The monitoring results is recorded consistently as per the approved frequency in the monitoring plan. During the site visit, it was confirmed that the necessary QA/QC procedures are in place and the data management is effective and reliable.

		reduction calculations.	For the monitoring period, PP has randomly selected the ICS applying random sampling function in excel and accordingly the target ICS sample is determined for survey. The sample size has been determined following confidence/precision of 95/10 and total sample size arrived as 33 samples. However the PP chose additional 28 samples and in total 61 samples were surveyed during the monitoring surveys. Questionnaire survey form used by the surveyor and the survey results have been provided and checked. During the monitoring surveys, all the 61 selected samples were found to be operating. Hence it was concluded that the total number of operating stoves during the monitoring period were 14,088 stoves. However some of the households have more than 1 distributed households and hence the discounted 11,935 ICS have only been used in the emission reduction calculations, which is found conservative and appropriate. The monitoring surveys and the emission reductions excelsheet has been checked and found correct. Further the parameter has been checked through the acceptance sampling conducted during the site visit. The VVB conducted the acceptance sampling to check the monitoring surveys results/18/. Verification team has determined acceptance sample size for the sample survey parameter based on the Table-2 and guidance provided under para 28-33 of standard "Sampling and surveys for CDM project activities and programmes of activities" version 9/7/. During the on-site visit a sampling approach has been used by the audit team to verify the reported values for the monitored parameters in the joint PD & MR. The sampling approach included households which have been included in the monitoring survey by the CME. Accordingly, the audit team verified a total of 11 Samples as per the details provided in Section 2.3 above and observed that the sampling survey results of the PP for all the checked HHs were found to be correct and hence acceptable. Thus the results of the monitoring parameter as available in the joint PD & MR were
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			confirmed and found correct inline with the applied methodology.
μ_y (Adjustment to account for any continued use of pre-project devices during the year y)	Fraction	1.0 (for the Masupa stoves determined for the monitoring period) 0.9711 (for the BURN Jikokoa stoves determined for the monitoring period) 1.0 (for the Kunikoa stoves determined for the monitoring period)	The parameter is determined with the help of representative sampling (monitoring surveys). The sample size is determined to achieve 95/10 confidence precision according to the latest version of Standard for sampling and surveys for CDM project activities and programme of activities irrespective of annual/biennial survey. The monitoring plan for the parameter is found appropriate (as per measurement methods and procedures to be applied) and inline with the applied methodology. The monitoring results is recorded consistently as per the approved frequency in the monitoring plan. During the site visit, it was confirmed that the necessary QA/QC procedures are in place and the data management is effective and reliable. For the monitoring period, PP has randomly selected the ICS applying random sampling function in excel and accordingly the target ICS sample is determined for survey. The sample size has been determined following confidence/precision of 95/10 and total sample size arrived as 33 samples. However the PP chose additional 28 samples and in total 61 samples were surveyed during the monitoring surveys. Questionnaire survey form used by the surveyor and the survey results have been provided and checked. During the monitoring surveys, the following results were obtained: - 1.0 (for the Masupa stoves determined for the monitoring period) - 0.9711 (for the BURN Jikokoa stoves determined for the monitoring period) - 1.0 (for the Kunikoa stoves determined for the monitoring period) The monitoring surveys and the emission reductions excelsheet has been checked and found correct.

			Further the parameter has been checked through the acceptance sampling conducted during the site visit. The VVB conducted the acceptance sampling to check the monitoring surveys results. Verification team has determined acceptance sample size for the sample survey parameter based on the Table-2 and guidance provided under para 28-33 of standard “Sampling and surveys for CDM project activities and programmes of activities” version 9/7/. During the on-site visit a sampling approach has been used by the audit team to verify the reported values for the monitored parameter in the joint PD & MR. The sampling approach included households which have been included in the monitoring survey by the CME. Accordingly, the audit team verified a total of 11 Samples as per the details provided in Section 2.3 above and observed that the sampling survey results of the PP for all the checked HHs were found to be correct and hence acceptable. Thus the results of the monitoring parameter as available in the joint PD & MR were confirmed and found correct inline with the applied methodology.
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Further the accuracy of the following monitoring parameters have also been checked and summarized as below:

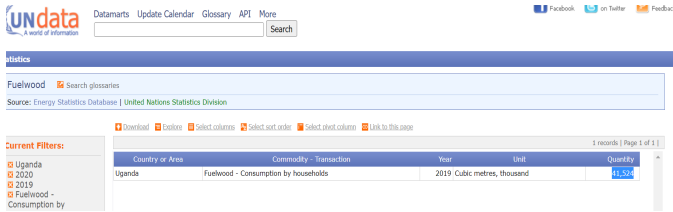
Data/parameter	Unit	Value applied	Assessment
Date of commissioning of batch j	Date	02/01/2021 (<i>the first cookstove distributed under batch 1</i>)	The date of commissioning of the ICS is fixed and recorded at the time of commissioning/distribution of the ICS. The installation records have been checked and found that it has adequate provision to record the date of commissioning of the project ICS. During the site visit, it was confirmed that the necessary QA/QC procedures are in place and the data management is effective and reliable. The first ICS distributed under the batch 1 was on 02/01/2021, which was confirmed based on the purchase receipt of the ICS/17/ and hence found correct. For the monitoring period, the date of commissioning of sample ICS have been checked through the acceptance

			sampling conducted during the site visit. Verification team has determined acceptance sample size for the parameter based on the Table-2 and guidance provided under para 28-33 of standard “Sampling and surveys for CDM project activities and programmes of activities” version 9/7/. The sampling approach included households which have been included in the monitoring survey by the CME. Accordingly, the audit team verified a total of 11 samples as per the details provided in Section 2.3 above and observed that the commissioning dates of the stoves in HHs were found to be correct and hence acceptable. The installation records have been checked and found that it has the commissioning dates of the installed ICS, and the provision is found to be inline with the applied methodology.																												
$\eta_{new,i,j}$ (Efficiency of the device of each type i and batch j implemented as part of the project activity)	Fraction	0.537 (initial efficiency for Burn Jikokoa stove) 0.382 (initial efficiency for Masupa stove) 0.424 (initial efficiency for Kuniokoa stove)	The initial efficiency of the stoves have been determined based on the tests reports for each of the ICS types and hence found appropriate. The tests have been conducted by reputed and authentic Labs (CREEC- Centre for research in energy and energy conservation, KIRDI Stove Testing Centre)/16/ and hence found appropriate. Further the efficiency of the ICS degrades over the years and the same has been calculated based on the following formula based on the applied methodology: $\eta_{new,i,y} = \eta_p \times (DF_n)^{y-1} \times 0.94$ Thus the yearly efficiency during the subsequent years of the crediting period arrives as follows: <table border="1"> <thead> <tr> <th>Depreciated Efficiencies as per VMRO006</th><th>Burn Jikokoa Model</th><th>Masupa Model</th><th>Kuniokoa Model</th></tr> </thead> <tbody> <tr> <td>Initial ICS efficiency (η_p)</td><td>0.537</td><td>0.382</td><td>0.424</td></tr> <tr> <td>Year End</td><td>Stove efficiency</td><td>Stove efficiency</td><td>Stove efficiency</td></tr> <tr> <td>1</td><td>0.505</td><td>0.359</td><td>0.399</td></tr> <tr> <td>2</td><td>0.500</td><td>0.355</td><td>0.395</td></tr> <tr> <td>3</td><td>0.495</td><td>0.352</td><td>0.391</td></tr> <tr> <td>4</td><td>0.490</td><td>0.348</td><td>0.387</td></tr> </tbody> </table>	Depreciated Efficiencies as per VMRO006	Burn Jikokoa Model	Masupa Model	Kuniokoa Model	Initial ICS efficiency (η_p)	0.537	0.382	0.424	Year End	Stove efficiency	Stove efficiency	Stove efficiency	1	0.505	0.359	0.399	2	0.500	0.355	0.395	3	0.495	0.352	0.391	4	0.490	0.348	0.387
Depreciated Efficiencies as per VMRO006	Burn Jikokoa Model	Masupa Model	Kuniokoa Model																												
Initial ICS efficiency (η_p)	0.537	0.382	0.424																												
Year End	Stove efficiency	Stove efficiency	Stove efficiency																												
1	0.505	0.359	0.399																												
2	0.500	0.355	0.395																												
3	0.495	0.352	0.391																												
4	0.490	0.348	0.387																												

			5	0.485	0.345	0.383
			6	0.480	0.341	0.379
			7	0.475	0.338	0.375
The calculations for the above efficiencies have been checked based on the calculations submitted in the ERs Excelsheet and found correct. The parameter is monitored appropriately, in accordance with the monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. During the site visit, it was confirmed that the necessary QA/QC procedures are in place and the data management is effective and reliable.						

Hence the monitoring parameters meet the requirements stipulated in the applied methodology (VMR0006-Methodology for Installation of High Efficiency Firewood Cookstoves, version 1.1) and “Sampling guidelines/Sampling Standard”

Below tables describe applicable data/parameters fixed ex-ante:

Data/parameter	Unit	Value applied	Assessment
Bold (Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices)	Tonnes/year	4.38 tonnes wood-eq/HH-yr (For Firewood baseline) 6.023 tonnes/HH/year (For charcoal baseline) 5.200 tonnes/HH/year (for the	The UN data has been referred for the household firewood consumption in Uganda. The “Energy Statistics Database United Nations Statistics Division”/37/ for year 2019 has been referred as follows:  The “Firewood - consumption by households” arrives as “41,524 thousand cubic meters”, which is equal to $41524 * 1000 \text{ Meter}^3 = 41524000 \text{ Meter}^3$

		ex-ante calculations)	Using the conversion factor between cubic metres and metric tonnes (as 1.38/29/), the total consumption in tonnes arrive as follows: $41524000/1.38 = 30089855.07$ tonnes The population of Uganda in 2019 and family size was “41000000” and “4.6” respectively/30/. Further the population of Uganda using firewood as fuel=77%/31/ The firewood consumption per household comes out as = $30089855.07 \text{ tonnes} / (41000000 / 4.6) * 0.77 \text{ HH}$ =4.38Tonnes/Year Similarly the Charcoal consumption in the household has been calculated: In 2019 the household charcoal consumption in Uganda as per the UN data is: 1,870,000 MT The population of Uganda in 2019 was = 41000000 (Same source as above) Family size of Uganda=4.6 (Same source as above) Population of Uganda using charcoal as fuel=20.9%/31/ The charcoal consumption per HHs comes out as= $1,870,000 \text{ Tonnes} / (41000000 / 4.6) * 0.209 \text{ HH}$ =1.004 Tonnes/HH Charcoal to wood conversion factor: 6 Therefore, the corresponding value for charcoal baseline in terms of wood as: =1.004*6 Tonnes/HH*HH (In terms of charcoal) 6.023 Tonnes/Year (In terms of firewood) For the ex-ante emission reduction calculations, the quantity of woody biomass used has been considered based on 50% wood and 50% charcoal usage in the three types of distributed ICS in future. The assumption is based on the projections of the project proponent on the distribution of type of ICS (wood/charcoal) in future.
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			Hence the 5.20 Tonnes/HH/year has been considered for the ex-ante calculation of baseline emissions, which is found appropriate. The above calculations are based on the suitable authentic sources (UN data) and hence found correct and hence acceptable to the assessment team. The VVB has further checked other similar type of registered projects in Uganda (CDM PoA 10610, CDM PoA 10349, CDM PoA 9956, CDM PoA 7359), which were registered in last 2-3 years and found that B_{old} (wood) varies between 4.5 tonnes/hh/year to 4.97 tonnes/hh/year. Hence the B_{old} (wood) considered as “4.38 tonnes/hh/year” has been found to be conservative and hence appropriate.
NCV _{woodfuel} (Net calorific value of the non-renewable woody biomass that is substituted or reduced)	TJ/tonne	0.0156	The value has been sourced as default value from the applied methodology (VMR0006, v1.1)/5/, which is based on the IPCC default for wood fuel and hence acceptable to the assessment team.
EF _{wf,CO2} (CO ₂ emission factor for the use of wood fuel in baseline scenario)	tCO ₂ /TJ	112	The value has been sourced as default value from the applied methodology (VMR0006, v1.1)/5/, which is based on the IPCC default for wood fuel and hence acceptable to the assessment team.
EF _{wf,non CO2} (The non-CO ₂ emission factor for the use of wood fuel in baseline scenario)	tCO ₂ /TJ	26.23	The value has been sourced as default value from the applied methodology (VMR0006, v1.1)/5/, which is based on the IPCC default for wood fuel and hence acceptable to the assessment team.
f _{NRB,y} (Fraction of non renewable biomass saved by the project activity)	Fraction	0.9790	The fraction of woody biomass that can be established as non- renewable (fNRB) has been calculated as follows: $f_{NRB} = \frac{NRB}{NRB + RB}$

			where: fNRB = Fraction of non-renewable biomass in the country/region or project area (fraction or %) NRB = Quantity of non-renewable biomass (t/yr) in the country/region or project area (t/yr) RB = Quantity of renewable biomass in the country/region or project area (t/yr) The quantity of NRB in a country- or region-specific basis is determined by calculating the total consumption of wood (H) in the country or region and then deducting the quantity of renewable biomass (RB) from it. The fNRB calculations is in line “Methodological Tool 30: Calculation of the fraction of non-renewable biomass” /8/and found correct. As it is clearly traceable from the CDM webpage of the fNRB Tool that the “requests for registration can be submitted until 5 May 2023” with the version 03 of “Tool: Calculation of the fraction of non-renewable biomass” /8/. Hence using the version 03 of the fNRB Tool is found appropriate. The detailed calculations are presented in the Appendix 5 of the joint Validation & Verification Report.
η_{old} (Efficiency of baseline cookstove)	Fraction	0.1 (for firewood stoves) 0.15 (for conventional charcoal stoves)	A default value of 0.1 shall be used if baseline device is a three- stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney. The default value of 0.1 is as per the applied methodology and hence acceptable. For the charcoal stoves, the efficiency of 0.15 has been considered, which is found conservative inline with the research paper “<i>Development of bioenergy technologies in Uganda: A review of progress</i>”, which clearly states “<i>Traditional charcoal stoves, on the other hand, are locally made using scrap metal materials such as roofing sheets and oil drums, but do not have insulation lining; therefore, leading to excessive heat loss during operation. The efficiency of these stoves is reported to be less than 10%</i>”. Hence considering the efficiency of 15%

			as compared to 10% leads to conservative emission reductions and appropriate. As per the distributions plan, PP has assumed 50% three stones stoves for the firewood baseline and 50% inefficient charcoal stoves will be distributed, hence the weighted average efficiency of 12.5% has been considered for calculations. For ex-post calculations, the actual ratio has been factored in the calculations.
η_P (Efficiency of project stove at the start of project activity)	Fraction	0.537 (Burn Jikokoa Model) 0.382 (Masupa Model) 0.424 (Kuniokoa Model)	The efficiency of the ICS have been considered based on the tests reports for each of the ICS and hence found appropriate. The tests have been conducted by reputed and authentic Labs (CREEC-Centre for research in energy and energy conservation, KIRDI Stove Testing Centre)/16/ and hence found appropriate. Further the CDM approved CPA (CPA 9265-P1-0016-CP1 :Top Third Ventures Stove Programme CPA KE0016 – BURN Efficient Cookstoves for Kenya) and corresponding monitoring report has been checked as per which the Jikokoa stove's have efficiency between 54.11% and 57.35%, hence the efficiency of the Jikokoa ICS as 53.7% considered in the project activity is found conservative and appropriate. Similarly the CDM approved CPA (CPA 9265-P1-0014-CP1 :Top Third Ventures Stove Programme CPA KE0014 – BURN Efficient Cookstoves for Kenya) and corresponding monitoring report has been checked as per which the Kuniokoa stove has certified thermal efficiency around 41.90%, hence the efficiency of 42.4% is found reasonable.
Life span	Years	7	The lifetime of 7 years have been considered based on the technical specifications submitted for the ICS. The project participant will either distribute/replace the ICS after the end of lifetime of each model or will not claim the ERs after the end of lifetime. The lifetime of the stoves were confirmed through the interviews conducted with the manufacturers at the time of site visit.

The equations for the calculation of emission reduction is provided in the joint PD & MR and confirmed with the applied methodology VMR0006 Version 1.1 and found to be correct. The values as provided in the joint PD & MR have been compared with ER verification sheet. Moreover, the formulae applied in the ER spreadsheet were

also reviewed and found to be consistent with the applied methodology. The verification team confirms that all parameters are used correctly in the calculations, all results are verifiable and transparent, all assumptions are described and based on verifiable evidence and calculations are done in accordance with the formulae laid out in the applied methodology VMR0006, Version 1.1 and requirements of the monitoring plan. The total number of emission reductions for the monitoring period from 02/01/2021 to 31/07/2022 is 147,136 tCO₂e. The calculation of emission was checked in ER sheet and found to be correct, hence accepted.

The baseline emissions, project emissions and emission reductions achieved during the monitoring period is summarized as 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)
2021	92,888	0	0	92,888
2022	54,248	0	0	54,248
Total	147,136			147,136

The baseline emissions, project emissions and leakage emissions have been found to be consistent with the emission reductions excelsheet and hence found correct.

4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

The quality of supporting documents that are provided by the PP as evidence is adequate. ICS distribution records and ICS monitoring survey records are provided, which tallies with the data provided in the ER verification spreadsheet.

Competent employees are recruited for the management and operation of the project. The quality of supporting evidences submitted to DOE for verification is adequate and found to be verifiable. ICS distribution records and ICS survey records were checked by the assessment team to confirm the authenticity of the documents and to check the correctness of the calculations. The verification team for the records and future reference also obtains copies of these documents. The detailed information flow with the roles and responsibilities of the individuals and the monitoring system have been discussed and found to be appropriate.

Based on the above, the assessment team confirms the sufficiency and appropriateness of the quality of evidence provided by the PP to determine the GHG reductions and further deems them to be acceptable.

5 VALIDATION AND VERIFICATION CONCLUSION

4KES, contracted by PERSISTENTCLIMATE INDIA PRIVATE LIMITED, to perform a joint validation and verification of the VCS project activity “Reduced Emissions from Improved and Efficient Cooking in Ugandan Communities”, VCS ID: 3045. The joint validation and verification process were performed on the basis of all guidance and criteria as provided in VCS Standard (version 4.3)/4/, VCS Program Guide (version 4.2)/3/ and Registration & Issuance Process (version 4.2)/3/.

The conclusions of validation and verification process can be individually summarized as follows:

Validation Conclusion:

The project activity provides the information in joint PD & MR as required by VCS Standard, version 4.3/7/ and in 4KES’s opinion, the project meets the requirements of the applied baseline and monitoring methodology, VMR0006, Version 1.1/5/. The validity of methodology (version 1.1) is from 22/07/2021/5/. The validation has been performed using a risk-based approach, as described above. The expected emission reductions from the project activity during the course of its crediting period (ten years) will be 3,342,291 tCO₂e. 4KES concludes the validation with a positive opinion and confirms that the VCS Project Activity “*Reduced Emissions from Improved and Efficient Cooking in Ugandan Communities*”, as described in the joint PD & MR meets all applicable VCS requirements, including those specified in the CDM Project Standard, relevant methodologies, tools and guidelines. The selected baseline and monitoring methodology VMR0006, Version 1.1/5/ is applicable to the project and correctly applied. 4KES therefore requests the registration of the project as a VCS project activity.

Verification Conclusion:

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 02/01/2021 to 31/07/2022 are fairly stated in the joint PD and MR. The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology and the VCS standard.

Verification period: From 02/01/2021 to 31/07/2022 (including both days)

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)
Year 2021	92,888	0	0	92,888

Year 2022	54,248	0	0	54,248
Total	147,136			147,136

4KES confirms a positive verification opinion confirming that the project complies with the applicable VCS requirements, thus recommending the project for issuance.

APPENDIX 1: DOCUMENT REFERENCES

The following table lists the documentation that were reviewed during this joint validation and verification of the grouped project activity:

1.	Joint VCS PD&MR for “<i>Reduced Emissions from Improved and Efficient Cooking in Ugandan Communities</i>”, version 1.1 dated 06/07/2022 and version 2.3 dated 10/01/2023 Joint VCS PD&MR for “<i>Reduced Emissions from Improved and Efficient Cooking in Ugandan Communities</i>”, version 3 dated 06/02/2023
2	Emission Reduction Calculation Excelsheet (ex-ante) version 1.1 dated 06/07/2022 and version 2 dated 10/01/2023 Emission Reduction Calculation Excelsheet (ex-post) version 1.1 dated 06/07/2022 and version 2 dated 10/01/2023 Emission Reduction Calculation Excelsheet (ex-post) version 1.1 dated 06/07/2022 and version 3 dated 06/02/2023
3	VCS: VCS Program Guide, version 4.2 dated 22/06/2022 VCS Program Definitions (v4.2, dated 22/06/2022) VCS Registration & Issuance Process (v4.2, dated 22/06/2022)
4	VCS: VCS Standard, version 4.3 dated 22/06/2022 VCS validation and verification manual version 3.2
5	VCS approved methodology: VMR0006: “Methodology for Installation of High Efficiency Firewood Cookstoves”, Version 1.1 CDM approved methodology: Baseline and Monitoring Methodology “AMS-II.G”, “Energy efficiency measures in thermal applications of non-renewable biomass”, version 11 & version 13
6	UNFCCC: Guidelines for Sampling and Surveys for CDM Project activities and Programme of Activities, Ver. 4.0 (EB86, Annex 4)
7	UNFCCC: Standard for Sampling and surveys for CDM project activities and programmes of activities, Version 09.0
8	Tool for demonstration and assessment of additionality” Version-7.0.0 EB 70 Annex-08 is applied to demonstrate additionality TOOL30: Calculation of the fraction of non-renewable biomass”; Version-03, EB 108, Annex 11 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v1.pdf/history_view

9	UNFCCC: Project search: https://cdm.unfccc.int/Projects/projsearch.html CDM project standard for project activities, version 03.0 CDM validation and verification standard, version 03.0
10	VERRA: https://registry.verra.org/app/projectDetail/VCS/3045
11	Gold Standard Foundation: https://registry.goldstandard.org/projects?q=&page=1
12	VCS: Joint VCS Project Description & Monitoring Report template, VCS Version 4.1 of 22/02/2022
13	End user agreement between CME and End-user/Agreement to transfer the carbon emission reduction ownership rights from end-user to CME/project implementer / ICS Receipts/Sale Receipts
14	Invoice from Masupa Enterprises to EzyLife Holdings Ltd. and PersistentClimate India Pvt. Ltd. dated 22/07/2022 Purchase order from EzyLife Holdings Ltd. to Burn Manufacturing USA LLC dated 22/10/2021 Purchase order from EzyLife Holdings Ltd. to Burn Manufacturing USA LLC dated 01/02/2021 Invoice from Burn Manufacturing USA LLC to EzyLife Holdings Uganda Ltd. dated
15	Declaration on the distribution cost of the ICS (Masupa ICS, BURN Jikokoa ICS, BURN Kuniokoa ICS) from Manufacturer to End-user dated 22/07/2022
16	Technical specifications (including thermal efficiency, lifetime) of the ICS stoves distributed in the project activity Stove Performance Certificate from CREEC dated 27/06/2020 (Tests report Number: B/TR/2020/015) for the Burn Kuniokoa stove Test Report from KIRDI Stove Testing Centre dated 13/10/2020 for Burn Jikokoa stove Stove Test Report from CREEC (CRC/FORM/GN-56) for Masupa stove Declaration from Masupa dated 21/09/2022 on the lifetime of Masupa stoves
17	Evidences to check the start date of VCS project activity
18	Monitoring Survey Excelsheet and Monitoring Survey sheets
19	Project Installation Database/Sale Database
20	Declaration to comply with various requirements under VERRA dated 25/09/2022
21	Supporting documents for the local stakeholder consultation (individual Invitations, newspaper advertisements, photographs, attendance sheets etc.)

22	Africa Energy Outlook 2019 by International Energy Agency https://iea.blob.core.windows.net/assets/2f7b6170-d616-4dd7-a7ca-a65a3a332fc1/Africa_Energy_Outlook_2019.pdf
23	The Renewable Energy Policy for Uganda by Ministry of Energy and Mineral Development, Uganda https://s3-eu-west-1.amazonaws.com/s3.sourceafrica.net/documents/118159/Uganda-Renewable-Energy-Policy.pdf
24	As assessment of the fuelwood situation in Bushenyi and Mbarara districts, Uganda by Centre for Environment Studies, University of Tasmania https://eprints.utas.edu.au/20247/1/whole_KahangireBatuuraine1985_thesis.pdf
25	Uganda Woodfuels Overview (Technical Report) by Ministry of Water and Environment, Republic of Uganda (June 2019) https://www.wavespartnership.org/sites/waves/files/kc/WAVES-Woodfuel%20Overview%20Technical%20Report%20Design%20Layout%20Final%20October.pdf
26	Efficient Cook Stoves reduce Emissions in Uganda https://www.myclimate.org/information/carbon-offset-projects/detail-carbon-offset-projects/uganda-efficient-cook-stoves-7245/
27	Uganda's cooking energy sector: A Review by Modern Energy Cooking Service (MECS) dated May 2022 https://mecs.org.uk/wp-content/uploads/2022/06/Ugandas-cooking-energy-sector-a-review.pdf
28	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1 Introduction 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion
29	Tools and Resources (Conversion factors) https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2018/sources/timber-2/conversion-factors/
30	Uganda National Household Survey 2019/2020 Summary Report, Posted on 3 Jun 2021 by CPAR Uganda https://www.ubos.org/wp-content/uploads/publications/09_2021Uganda-National-Survey-Report-2019-2020.pdf
31	Sun-Connect (Sub-Saharan Africa news)

	https://sun-connect.org/fact-check-do-7-out-of-10-ugandans-use-firewood-for-cooking/
32	Development of bioenergy technologies in Uganda: A review of progress https://www.sciencedirect.com/science/article/abs/pii/S1364032112005461
33	National Environment Management Authority (NEMA): Environmental Laws https://www.nema.go.ug/projects/environmental-laws
34	Clean Cooking Energy in Uganda – technologies, impacts, and key barriers and enablers to market acceleration by Institute of Development Studies, 17/08/2017 https://assets.publishing.service.gov.uk/media/5bae05abe5274a3e019d86ae/191_Clean_cooking_energy_Uganda.pdf
35	Uganda Forest Cover (Statistics) https://rainforests.mongabay.com/deforestation/forest-information-archive/Uganda.htm
36	Global Forest Resources Assessment 2010 (FAO)
37	UN Data Statistics (Energy Statistics Database> United Nations Statistics Division) http://data.un.org/Data.aspx?q=fuelwood&d=EDATA&f=cmID%3aFW
38	State of Uganda's Forestry 2016, published by Ministry of Water and Environment Uganda
39	UN REDD report on Forestry and Macroeconomic Account of Uganda
40	UN Data on fuel consumption (2017) http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW Charcoal consumption by household is not considered to avoid double counting, which is appropriate.
41	UN Data on fuel consumption (2017) http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aCH http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW
42	World Bank Data: https://data.worldbank.org/country/uganda?view=chart
43	The National Environment Act, 2019 https://www.nema.go.ug/projects/national-environment-act-2019
44	The National Environmental (Audit) Regulations, 2020 https://leap.unep.org/countries/ug/national-legislation/national-environment-audit-regulations-2020-no-47-2020
45	The National Environment (Environmental and Social Assessment) Regulations, 2020. https://www.fao.org/faolex/results/details/es/c/LEX-FAOC203439/

46	National Environment Action Plan (NEAP) and National Environment Management Policy (NEMP) of 1994
47	National Forestry and Tree Planting Act (hereafter Forest Act), Laws of Uganda (Uganda Law Reform Commission)
48	The 1995 Constitution of Uganda
49	The National Environment Act, 1995

APPENDIX 2: ABBREVIATIONS

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CL	Clarification Request
EB	Executive Board
ER	Emission Reductions
FAR	Forward Action Request
GHG	Greenhouse Gases
ICS	Improved Cookstoves
IPCC	Intergovernmental Panel for Climate Change
ISO	International Organization for Standardization
LE	Local Expert
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
TE	Technical Expert
TL	Team Leader
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCSA	Verified Carbon Standard Association
VCU	Verified Carbon Unit

APPENDIX 3: VERIFICATION FINDINGS

Table 1. Clarifications from this joint validation & verification

CL ID	01	Section no.	1.4	Date: 13-09-2022
Description of CL				
Section 1.4: Please refer to the paragraph 3.5.15 and 3.5.16 of the “VCS Standard, version 4.3”, as per which the following additional set of eligibility criteria shall ensure that new project activity instances: 1. Meet the applicability conditions set out in the methodology applied to the project. 2. Have a start date that is the same as or later than the grouped project start date. Hence the above eligibility criteria shall be incorporated in the VCS-PD accordingly.				
Project participant response				Date: 22/09/2022
The group VCS PD is updated now to incorporate two additional criteria as cited by VVB.				
Documentation provided by project participant				
Updated VCS PD.				
DOE assessment				Date: 26/09/2022
The additional set of the eligibility criteria related to the applicability conditions and start date has been incorporated in the VCS-PD and found correct. The Comment is closed.				

CL ID	02	Section no.	1.4	Date: 13-09-2022
Description of CL				
Section 1.4: For the Eligibility Criteria No. 3, the relevant details on the <i>“type of service, performance specifications including compliance with testing/certifications”</i> shall be provided. Further Eligibility criteria requires the minimum thermal efficiency of 25%, however column “supporting evidence for inclusion” discuss on thermal efficiency greater than 20%. Check.				
Project participant response				Date: 22/09/2022
The WBTs/Manufacturer’s efficiency undertaken for each type of stoves included are the basis of initial efficiency. The same has been mentioned in VCS PD.				
Documentation provided by project participant				
Updated VCS PD.				
DOE assessment				Date: 26/09/2022
The additional details related to the product description, technical specifications and efficiency certificate has been submitted. <i>“type of service, performance specifications including compliance with testing/certifications”</i>. It is found that the efficiency of the improved stoves are more than 25% and hence also above the efficiency of the baseline devices. Hence the Comment is closed.				

CL ID	03	Section no.	1.4	Date: 13-09-2022
Description of CL				
Section 1.4: As per the Eligibility Criteria No. 4 (Section 1.4) and Section 3.5, <i>“There is no mandatory legal requirement for installation of cookstoves in households/institutions of Uganda. The evidence of applicable policies shall be submitted to VVB. No need for further substantiation”</i>. Hence the relevant evidence shall be submitted.				
Project participant response				Date: 22/09/2022

Uganda's Renewable Energy Policy was adopted in 2007 whose targets were to increase the rate of adoption of efficient charcoal stoves from 20,000 in 2007, to 2,500,000 by 2017 in urban areas and efficient fuel wood stoves from 170,000 in 2007, to 500,000 by 2012 and 4,000,000 by 2017 . In addition, the policy was to offer training opportunities for artisans at the village level for the manufacture, installation and maintenance of efficient cooking stoves. However, the current status of how much has been achieved is unknown. The country has not had the financial and technical support, nor created the enabling conditions required to attract the level of private investment needed to create a thriving market for clean cookstoves and fuels. The policy doesn't mandate the households to purchase the improved cookstoves and does not enforce the implementers too. The policy link is given below.

Refer the web links below for the applicable policy and the scenario.

Documentation provided by project participant

https://assets.publishing.service.gov.uk/media/5bae05abe5274a3e019d86ae/191_Clean_cooking_energy_Uganda.pdf

<https://s3-eu-west-1.amazonaws.com/s3.sourceafrica.net/documents/118159/Uganda-Renewable-Energy-Policy.pdf>

DOE assessment

Date: 26/09/2022

A review is made on Uganda environmental laws and regulations⁴ as below:

- a) The National Environment Act, 2019
- b) The National Environmental (Audit) Regulations, 2020
- c) The National Environment (Environmental and Social Assessment) Regulations, 2020.
- d) National Environment Action Plan (NEAP) and National Environment Management Policy (NEMP) of 1994
- e) National Forestry and Tree Planting Act (hereafter Forest Act), Laws of Uganda (Uganda Law Reform Commission)
- f) The 1995 Constitution of Uganda
- g) The National Environment Act, 1995
- h) https://assets.publishing.service.gov.uk/media/5bae05abe5274a3e019d86ae/191_Clean_cooking_energy_Uganda.pdf
- g) <https://s3-eu-west-1.amazonaws.com/s3.sourceafrica.net/documents/118159/Uganda-Renewable-Energy-Policy.pdf>

The Uganda national policy doesn't mandate the households to purchase the improved cookstoves and does not enforce the implementers too. Hence there is no mandatory legal requirement for installation of cookstoves in households/institutions of Uganda.

Hence the comment is closed.

⁴ <https://www.nema.go.ug/projects/environmental-laws>

CL ID	04	Section no.	1.12	Date: 13-09-2022
Description of CL				
Section 1.12: As per the requirement of VCS-PD filling guidelines, “Indicate the project location and geographic boundaries (if applicable) including a set of geodetic coordinates. For grouped and AFOLU projects, coordinates may be submitted separately as a KML file”. Hence additional details w.r.t to the above requirements shall be submitted.				
Project participant response				Date: 22/09/2022
The KML file is already submitted to VERRA during listing, the same comment was also raised prior to listing by VERRA and closed after the submission of kml file. KML file can be seen from the project page at VCS registry.				
Documentation provided by project participant				
DOE assessment				Date: 26/09/2022
It is confirmed from the project webpage on the VERRA registry that the KML file is already submitted to VERRA during listing, The KML file is hence accessible and hence the comment is closed. The Comment is closed.				

CL ID	05	Section no.	2.2	Date: 13-09-2022
Description of CL				
Section 2.2: The statement “The Local Stakeholder meeting was conducted both physically on 06th of July 2022” looks incomplete. Check. Further as per the requirements of the VCS-PD filling guidelines, “The mechanism for on-going communication with local stakeholders” shall be described in the VCS-PD.				
Project participant response				Date: 22/09/2022
The statement has been updated; it was an error. The local stakeholders will be further engaged during the verification/implementation. The implementers shall keep the provisions of input register at local site.				
Documentation provided by project participant				
DOE assessment				Date: 26/09/2022
PP has discussed on the mechanism for on-going communication with local stakeholders in the VCS-PD. Hence the comment is closed.				

CL ID	06	Section no.		Date: 13-09-2022
Description of CL				
The following documents shall be submitted: - Waiver of carbon credits from the end users (as per the Eligibility Criteria No. 12) - Written attestation from the project proponent/implementer confirming that the ICSs distributed in the new project instance are not part of any other CDM or Voluntary GHG trading scheme (as per the Eligibility Criteria No. 2) - Thermal Efficiency Test results (as per the Eligibility Criteria No. 3) - ODA declarations to attest that no funding from annex 1 parties that leads to diversion of ODA has been used in the project (as per the Eligibility Criteria No. 6) - Undertaking that any other GHG program has not rejected the project activity (as per the Section 1.15.2 of the VCS-PD) - Local Stakeholder related documents				
Project participant response				Date: 22/09/2022
The documents sought are attached with the response.				
Documentation provided by project participant				
- Waiver of carbon credits from the end users (as per the Eligibility Criteria No. 12) - Written attestation from the project proponent/implementer confirming that the ICSs distributed in the new project instance are not part of any other CDM or Voluntary GHG trading scheme (as per the Eligibility Criteria No. 2) - Thermal Efficiency Test results (as per the Eligibility Criteria No. 3) - ODA declarations to attest that no funding from annex 1 parties that leads to diversion of ODA has been used in the project (as per the Eligibility Criteria No. 6) - Undertaking that any other GHG program has not rejected the project activity (as per the Section 1.15.2 of the VCS-PD) - Local Stakeholder related documents				
DOE assessment				Date: 26/09/2022
All the above requested documents have been submitted. The Comment is closed.				

Table 2. Corrective Action Requests from this joint validation & verification

CAR ID	01	Section no.	2.4	Date: 13-09-2022
Description of CAR				

Section 2.4: The Section 2.4 shall be updated since the global stakeholder consultation process is now over.	
Project participant response	Date: 22/09/2022
Section 2.4 is updated now in joint template for VCD PD & MR. Kindly refer the latest template.	
Documentation provided by project participant	
joint template for VCD PD & MR	
DOE assessment	Date: 26/09/2022
The details on the global stakeholder consultation have now been updated in the Section 2.4 of the joint PD & MR. Further it is also confirmed from the project webpage on VERRA website that no stakeholder comments were received during the global stakeholder consultation process. Hence the comment is closed.	

CAR ID	02	Section no.	3.2	Date: 13-09-2022
Description of CAR				
Section 3.2: The scale has been considered as “Project” in Section 3.2, while the scale is “Large project” as per the Section 1.10 of VPA-DD. Check.				
Project participant response				Date: 22/09/2022
The scale is revised now, also the ex-ante ERs are changed based on the actual implementation schedule and update in ex-ante parameters.				
Documentation provided by project participant				
joint template for VCS PD & MR				
DOE assessment				Date: 26/09/2022
The scale has now been consistently updated throughout the joint PD & MR. The Comment is closed.				

CAR ID	03	Section no.	4.1	Date: 13-09-2022
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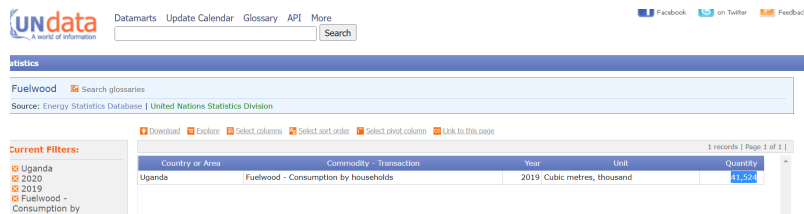
Description of CAR	
Section 4.1: The value of fNRB as “0.972” has been considered in the calculations of Emission Reductions ($ER_{y,i,j}$), however the value of “0.969” has been used in the Emission Reduction calculations in “ER Calculation_Uganda” spreadsheet of the ERs Excelsheet. Similarly the value of fNRB is mentioned as “0.975” in Section B.5.1 of the VCS-PD. Correct and consistent value shall be provided at all the places in the documents.	
Project participant response	Date: 22/09/2022
The fnrb is “0.972” and the same has been updated in the revised ex-ante ER sheet as well as in the joint template for VCD PD & MR.	
Documentation provided by project participant	
Joint template for VCS PD & MR. ER spreadsheet	
DOE assessment	Date: 26/09/2022
The value of fNRB has now been consistently provided as “0.972” in all the project documents. Hence the comment is closed.	

CAR ID	04	Section no.	4.4	Date: 13-09-2022
Description of CAR				
Section 4.4 & ERs Excelsheet: The different Emission Reductions are available for the Year-6 in the “Cell J13” and “Cell M9” as “350,385 tCO₂” and “364267 tCO₂” respectively in the “ER Calculation_Uganda” spreadsheet of the ERs Excelsheet. Check.				
Project participant response				Date: 22/09/2022
The ER sheet is updated now based on the revised implementation schedule. Kindly refer the recent version of ex-ante ER sheet.				
Documentation provided by project participant				
DOE assessment				Date: 26/09/2022

The Emission Reductions for all the years are now consistently provided in the joint VCS PD-MR & ERs Excelsheet. Hence the comment is now closed.

CAR ID	05	Section no.	5.1	Date: 13-09-2022
Description of CAR				
Section 5.1: Please refer to the ex-ante parameter “$B_{old,HH}$: Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices”. The value of the ex-ante parameter has been sourced from ‘CDM CPA in Uganda’. Hence the relevant details shall be provided how the ‘CDM CPA in Uganda has been found to be appropriate considering the project under validation. How the value of 4.97 tonnes wood-eq/HH-yr may be considered as appropriate. The relevant details shall be provided in this regard.				
Project participant response				Date: 22/09/2022
The value of B_{old} has been revised and UN data base is considered as the source for fuel wood and charcoal consumption in Uganda. The detail methodology of the chosen approach is part of updated joint VCD PD/MR template.				
Documentation provided by project participant				
joint VCD PD/MR template. UN Data Link				
DOE assessment				Date: 26/09/2022

The UN data has been used for the household firewood consumption in Uganda as follows:



The screenshot shows the UNdata website interface. The search results for 'Fuelwood' in 'Uganda' for the year '2019' are displayed. The table shows a quantity of 41,524,000 cubic metres, thousand.

Country or Area	Commodity - Transaction	Year	Unit	Quantity
Uganda	Fuelwood - Consumption by households	2019	Cubic metres, thousand	41,524

Firewood consumption in household:

The household firewood consumption in Uganda arrives as

$$41524 \times 1000 \text{ Meter}^3 = 41524000 \text{ Meter}^3$$

Using the conversion factor between cubic metres and metric tonnes (as 1.38⁵), the total consumption in tonnes arrive as follows:

$$41524000 / 1.38 = 30089855.07 \text{ Tonnes}$$

The population of Uganda in 2019 and family size was “41000000” and “4.6” respectively⁶.

Further the Population of Uganda using firewood as fuel=77%⁷

$$\text{The firewood consumption per HHs comes out as} = 30089855.07 \text{ Tonnes} / (41000000 / 4.6) \times 0.77 \text{ HH} \\ = 4.38 \text{ Tonnes/Year}$$

Charcoal consumption in household:

In 2019 the household firewood consumption in Uganda as per the UN data is:

$$1,870,000 \text{ MT}$$

The population of Uganda in 2019 was = 41000000 (Same source as above)

Family size of Uganda=4.6 (Same source as above)

Population of Uganda using charcoal as fuel=20.9%⁸

$$\text{The charcoal consumption per HHs comes out as} = 1,870,000 \text{ Tonnes} / (41000000 / 4.6) \times 0.209 \text{ HH} \\ = 1.004 \text{ Tonnes/HH}$$

Charcoal to wood conversion factor: 6

Therefore, the corresponding value for charcoal baseline in terms of wood as:

$$= 1.004 \times 6 \text{ Tonnes/HH} \times \text{HH (In terms of charcoal)}$$

$$6.023 \text{ Tonnes/Year (In terms of firewood)}$$

The above calculations based on the suitable sources are found correct and hence acceptable to the assessment team.

The Comment is closed.

CAR ID	06	Section no.	5.3	Date: 13-09-2022
Description of CAR				
Section 5.3: For the sample plan, the following parameter has been considered: <i>"$B_{y=1,new,i,j,survey}$: Quantity of woody biomass used by project devices in tonnes per device of type i and batch"</i> However the above parameter is not included as monitoring parameter in the Section 5.2 of the VPA-DD. Check.				
Project participant response				Date: 22/09/2022
Yes, PP is going with the B_{old} approach therefore the $B_{y=1,new,i,j,survey}$ is no more relevant. The VCD PD is revised to incorporate the changes.				
Documentation provided by project participant				
joint VCD PD/MR template.				
DOE assessment				Date: 26/09/2022
PP has not conducted the "$B_{y=1,new,i,j,survey}$", since the $B_{y,savings}$ have been calculated with the help of the following formula: $B_{y,savings,i,j} = B_{old} \times \left(1 - \frac{\eta_{old}}{\eta_{new,i,j}} \right)$ and hence there is no requirement to conduct the surveys in the project scenario. Hence the Comment is closed.				

⁵ <https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2018/sources/timber-2/conversion-factors/>

⁶ <https://cparuganda.com/2021/06/03/uganda-national-household-survey-2019-2020-summary-report/#:~:text=UBOS%20released%20the%202019%2F20,smallest%20in%20Kampala%203.4%20persons>

⁷ <https://sun-connect.org/fact-check-do-7-out-of-10-ugandans-use-firewood-for-cooking/>

⁸ <https://sun-connect.org/fact-check-do-7-out-of-10-ugandans-use-firewood-for-cooking/>

Table 3.FAR from this joint validation & verification

No FAR raised during this joint validation & verification.

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

APPENDIX 4: TEAM COMPETENCE

<u>Certificate of Competence</u>						
Name	☒ Mr. ☐ Ms.	Rohit Badaya				
Qualification Procedure	Fulfil 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	30-04-2022					
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.						

<u>Certificate of Competence</u>						
Name	☒ Mr. ☐ Ms.	Aziz Wakibi				
Qualification Procedure	Fulfil 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	No	No	No	Yes	No	No
Appointed Date	10-09-2022					
Authorized to work as Technical Expert for:						
Authorized Technical Area	Sectoral Scope		TA Code	Technical Area within the scope		
	3		3.1	Energy Demand		

Authorized to work as Local Expert for:	
Country/Countries	Uganda
Compliance check by: Anand S. R.	

Certificate of Competence						
Name	☒ Mr. ☐ Ms.	Ma Paa Puratchikkanal				
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
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 5: FNRB CALCULATIONS

The fraction of non-renewable biomass (fNRB) for the Uganda has been calculated as follows:

Step 1: Estimation of renewable biomass (RB) in the country of Uganda as per equation (6) of the fNRB tool

$$RB = \sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest,i})) + \sum (MAI_{other,i} \times (F_{other,i} - P_{other,i})) \quad \text{Equation (4)}$$

Where:

- $MAI_{forest,i}$ = Mean Annual Increment of woody biomass growth per hectare in sub-category i of forest areas in the relevant period (tonnes/ha/yr)
- $MAI_{other,i}$ = Mean Annual Increment of woody biomass growth per hectare in sub-category i of other land areas in the relevant period (tonnes/ha/yr)
- $F_{forest,i}$ = Extent of forest in sub-category i in the relevant period (ha)
- $F_{other,i}$ = Extent of other land in sub-category i in the relevant period (ha)
- $P_{forest,i}$ = Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest areas (in sub-category i) in the relevant period (ha)
- $P_{other,i}$ = Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within other land areas (in sub-category i) in the relevant period (ha)
- i = Sub-category i of forest areas and other land areas³

Parameters used:

Input parameter	Value	Data source
Extent of forest and other wooded land in 2015	(in ha)	
Forest (in 2015)	697,986	State of Uganda's Forestry 2016, published by Ministry of Water and Environment Uganda
Forest plantations (in 2015)	64,000	
Other wooded land (in 2015)	1,161,610	
Deforestation rate/year	(in ha)	Calculated based on forest/other wooded land figures from 1990 and 2015
Forest in 1990	8,80,693	State of Uganda's Forestry 2016, published by Ministry of Water and Environment Uganda
Forest in 2015 (excluding plantations)	6,33,986	
Forest loss between 1990 to 2015 (25 years)	2,46,707	
Annual Forest loss	9,868	
Forest (in 2021) (Fforest)	6,38,776	
Other wooded land (in 1990)	39,99,790	Calculated
Other wooded land (in 2015)	11,61,610	

2015)		
Other wooded land loss between 1990 to 2015 (25 years)	28,38,180	
Annual other wooded land loss	1,13,527	
Other wooded land (in 2021)	4,80,447	
Mean Annual Increment (MAI)		
MAI (Forest)	2 m ³ /ha/year	The mean annual increment for natural forest is taken as 2 m ³ /ha/year as per UN REDD report and MAI of other wooded land is considered as Bush land from IPCC as 0.9 t/ha/year, which is appropriate considering the status of other wooded land. The MAI for planted forest is considered as 20 m ³ /ha/year as a conservative approach.
MAI (Other wooded land)	0.9 t/ha/year	
Wood density	0.5811 t/m³	FAO ¹⁰ Average density of 282 different tree species for tropical Africa
Protected Areas	(in ha)	
Protected areas within forest areas	511,329	State of Uganda's Forestry 2016, published by Ministry of Water and Environment Uganda The data is taken as per published data by Ministry of Water and Environment Uganda, which is authentic and appropriate.
Protected areas within other wooded land areas	556,464	

The State of Uganda's Forestry 2016 by Ministry of Water and Environment Uganda for Extent of forest, other wooded land is being considered to be the most reliable, accurate and updated data source. It is in line with the fNRB tool.

The extent of forest and other wooded land from State of Uganda's Forestry 2016, which considers value up to 2015, is more than 6 years prior to submission of this project. Therefore, the 2015 values have been further extrapolated taking into account the historical loss of forest and other wooded land between 1990 and 2015 as indicated in the State of Uganda's Forestry 2016. The extrapolated 2021 values were used in the calculation of renewable biomass. Applying the values projected for 2021 in the NRB calculation is considered to be justified since it can be assumed that the historic deforestation from 1990 to 2015 continues to happen in future, in particular as Uganda's population continues to grow. Plantations are included in total forest area since products and by-products from plantations are accounted as per UN data in total wood fuel consumption.

The mean annual increment (MAI) data is sourced from UN REDD report on Forestry and Macroeconomic Account of Uganda. The value, since specific for Uganda forest, are the most appropriate and updated ones after having carried out an extensive literature research. It is in line with the fNRB tool which allows amongst other values from national studies or official statistics.

In terms of protected areas, data from Ministry of Water and Environment, Uganda is used which is in line with fNRB tool.

Step 2: Estimation of consumption of woody biomass (H) in the country of Uganda as per equation (4) of the fNRB tool

Data was drawn from the most recently available official reports/statistics, in this case from the UN's Statistics Division to demonstrate both the recent trend in increase of woodfuel use at the household level, plus also the most recently available data (from 2021).

This increase in fuelwood use at the household level has had a significant impact on the parameter value fNRB. The density of fuel is not a time bound parameter, hence average of 282 species in Africa is used as per published data by FAO.

Parameters used:

Input parameter	Value	Data source
Wood density	0.5811 t/m ³	FAO
Charcoal to wood biomass factor	6	https://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1ref3.pdf
Fuelwood consumption (m ³ /year)	4,86,56,000	UN Data on fuel consumption (2021) http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW Charcoal consumption by household is not considered to avoid double counting, which is appropriate.
Domestic wood consumption (t/year)	2,82,77,418	Calculated
Non-domestic fuelwood consumption (m ³ /year)	3,08,60,000	UN Data on fuel consumption (20121) http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW
Non-domestic wood consumption (t/year)	1,79,34,913	Calculated
H: Total woody biomass consumption (t/yr)	46,212,331 t/year	Calculated (2021)

Step 3: Estimation of quantity of non-renewable biomass (t/year) as per equation (2) of the fNRB tool

$$\text{NRB} = \text{H} - \text{RB}$$

where,

H = Total consumption of woody biomass in the applicable area in the relevant period (tonnes)

This step calculates the quantity of non-renewable biomass (t/year) (NRB) by subtracting the renewable biomass estimated from the total consumption of woody biomass estimated. No further input parameters are needed under this step.

$$NRB = 46,212,331 - 9,72,399$$

$$NRB = 45,239,931$$

Step 4: Estimation of fraction of woody biomass that can be established as non-renewable (fNRB) as per equation (1) of the fNRB tool

$$fNRB = \frac{NRB}{NRB + RB}$$

Equation (1)

This step calculates the fraction of woody biomass that can be established as non-renewable (fNRB). The non-renewable biomass is divided by the sum of non-renewable biomass and renewable biomass. No further input parameters are needed under this step.

$$fNRB = 45,239,931 / (45,239,931 + 9,72,399)$$

$$fNRB = \mathbf{97.90\%}$$