INSTALLATION OF HIGH EFFICIENCY WOOD BURNING COOKSTOVES IN KENYA

Project title	Installation of high efficiency wood burning cookstoves in Kenya
Project ID	VCS 2349[1]
Crediting period	06-October-2020 to 05-October-2030 (both days included)
Original date of issue	21-October-2022
Most recent date of issue	29-January-2026
Version	5.3
VCS Standard Version	4.7
Prepared by	Dr. Donee Alexander Bridge Carbon Africa Stoves Development Private Limited

[1] https://registry.verra.org/app/projectDetail/VCS/2349

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1 PROJECT DETAILS

1.1 Summary Description of the Project

A summary description of the technologies/ measures to be implemented by the project

The project involves the distribution of fuel-efficient improved cookstoves (ICS) in Kenya. The ICS disseminated through this project replaces the baseline practice of burning wood in rudimentary cookstoves or in three-stone fires. Under this project, two Total Land Care Rocket Stoves (TLC-RS) have been installed in eligible households throughout rural Kenya.

The ICS is more efficient and therefore requires less fuel than baseline practices. This reduces the reliance on partially unsustainable fuelwood, thereby reducing greenhouse gas emissions. The introduction of ICS saves both fuel costs and time spent on firewood collection. The time saved can be used for other activities such as education, socializing, resting, or even home-based enterprises that generate additional income for households, all of which can be empowering. Reducing emissions by transition to the ICS also helps reduce the risk of disease (including respiratory, cardiovascular, and cognitive diseases) from exposure to household air pollution. As the ICS consumes less firewood, it helps reduce forest degradation. This reduction in demand for fuelwood allows forests to regenerate, protecting wildlife habitats and biodiversity.

Through this project, 119,938 ICS have been distributed[2] in 59,969 households (two ICS in each household) in rural Kenya.

The end user is informed in advance that the use of the ICS generates carbon finance, which in turn is used for subsidising the price of the ICS and for recovering project implementation costs.

The Location of the project

The project has been implemented in Kenya. The details of the project location are provided in Section 1.13.

An explanation of how the project is expected to generate GHG emission reductions or removals

The ICS substitutes the current practice of cooking on three stone/conventional stoves. The ICS burns wood more efficiently than three stone fire due to the design of the cookstove. The ICS transfers more thermal energy to the pot than three stone fires where a large portion of heat energy is lost to surroundings. The overall result is fuel savings and consequently a reduction in greenhouse gas emissions,

A brief description of the scenario existing prior to the implementation of the project.

[2] Actual deployment details will be provided in MR during verification.

The baseline scenario is the continued use of partially non-renewable wood fuel over three stone/conventional stoves by the target population.

An estimate of annual average and total reductions and removals.

The average annual GHG emission reduction from the project is expected to be 34,343[3] tCO_2e/annum. Total GHG emission reduction from the project is expected to be 343,430 tCO_2e over the entire crediting period of 10 years.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	22-October-2022	VCS	Carbon Check (India) Private Ltd	N/A
Verification	06-October-2020 to 31-August-2021 (both days included)	VCS	Carbon Check (India) Private Ltd	0.90 years
Verification	01-September-2021 to 28-February-2022 (both days included)	VCS	VKU Certification Pvt. Ltd.	0.50 years
Verification	02-March-2022 to 15-September-2022 (both days included)	VCS	VKU Certification Pvt. Ltd.	0.54 years
Verification	16-September-2022 to 31-March-2023 (both days included)	VCS	VKU Certification Pvt. Ltd.	0.54 years
Verification	01-April-2023 to 31-March-2025 (both days included)	VCS	SustainCERT	2 years

1.3 Sectoral Scope and Project Type

Sectoral scope[4]	03 – Energy Demand
Project activity type	Type: II – Energy efficiency improvement projects

1.4 Project Eligibility

[3] Annual average ERs calculated using VMR0006 methodology from 06-October-2020 to 31-March-2023 and Ex-ante estimation using VM0050 methodology from 01-April-2023 to 05-October-2030.
[4] Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes

1.4.1 General eligibility

The project activity involves the construction of fuel-efficient ICS falls under the category of efficiency improvement in thermal application. Therefore, it is eligible under the scope of VCS Standard Version 4.7,

VCS Scope		Justification
2.2.1	The scope of the VCS Program includes:	
1	The seven Kyoto Protocol greenhouse gases.	The project activity aims to reduce CO_2 emissions, one of the GHGs identified under the Kyoto Protocol.
2	Ozone-depleting substances (ODS).	Not applicable, project does not involve the use or destruction of ODS.
3	Project activities supported by a methodology approved under the VCS Program through the methodology development and review process.	The project activity uses VCS approved methodology VM0050, v1.0.
4	Project activities supported by a methodology approved under an approved GHG program, unless explicitly excluded (see the Verra website for exclusions).	Not applicable, the project does not use a methodology approved under any other approved GHG program.
5	Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document	Not applicable. The project does not involve REDD+ projects
2.1.2	The scope of the VCS Program excludes projects that can reasonably be assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal, or destruction.	The project activity has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction. Hence, the criterion is met.
2.1.3	The VCS Program also excludes the project activities under the circumstances indicated in Table 1 of clause 2.1.3 of the VCS Standard version 4.7	The project is not listed in Table 1: Excluded Project Activities under section 2.1.3 of the VCS standard.

1.4.2 AFOLU project eligibility

As the project activity is non-AFOLU this section, 1.4.2, is not applicable for the grouped project activity.

1.4.3 Transfer project eligibility

As the project activity is not a transfer project or CPA seeking registration this section, 1.4.3, is not applicable.

1.5 Project Design

Indicate if the project has been designed as:

☐ Single location or installation

☐ Multiple locations or project activity instances (but not a grouped project)

☒ Grouped project

1.5.1 Grouped project design

For the inclusion of new project activity instances, i.e., ICS, the Project Proponent (PP) shall ensure that it meets the eligibility criteria per VCS standard version 4.7 section 3.6.16 below.

Sr. No.	Criterion	Compliance Requirement	How the new project activity instances to comply
1.	Meets the applicability conditions set out in the methodology applied to the project.	The project activity instance shall use VCS approved methodology -– VM0050: "Energy Efficiency and Fuel-Switch Measures in Cookstoves", version 1.0 and shall meet the applicability conditions set out in the methodology.	Details of how the project activity meets the applicability conditions as per section 4 "Applicability Conditions" of VM0050 methodology are defined in section 3.2 of this document.
2.	Use the technologies or measures specified in the project description.	Project activity deploys improved cookstoves (ICS) in households by replacing traditional cookstove with an initial thermal efficiency of at least 25%.	The manufacturer's specifications shall be used for establishing minimum efficiency criteria in the first year of stove installation.
3.	Apply the technologies or measures in the same manner as specified in the project description.	The ICSs will substitute the inefficient cooking techniques that are still adopted by the local communities. During the ICS delivery, information regarding biomass use as fuel and cooking baseline appliances will be	The ICS has higher efficiency and better emissions parameters than the baseline scenario. Evidence: Manufacturer's specifications

Sr. No.	Criterion	Compliance Requirement	How the new project activity instances to comply
		collected and stored in a data management system in order to facilitate the following validation and verification processes.	
4.	Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	All new project activity instances will be installed within Kenya only and the baseline scenario is the continued use of non-renewable wood fuel by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity. This also conforms to the applied methodology.	The project has the same baseline scenario defined in section 3.4 of this document, i.e., using baseline practice of burning wood in rudimentary cookstoves or three-stone fires in different regions of Kenya.
5.	Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area. For example, the new project activity instances have financial, technical and/or other parameters (such as the size/scale of the instances) consistent with the initial instances, or face the same investment, technological	Each project activity instance shall demonstrate its compliance with- Step 1: Regulatory Surplus - There is no mandated government programme or policy in the host country of this project ensuring the implementation and construction of new project activity instances. Step 2: Positive List – The project activity introduces: 1. Efficient biomass-fired cookstoves that replace inefficient	Step 1: There is no mandated government programme or policy in Kenya ensuring the implementation and construction 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. Step 2: The project activity satisfies criterion 1 and 2 of positive list. As the project fulfils the conditions under regulatory surplus & positive list, Hence, it is deemed additional. C. Project Method The financial indicator against which the project activity instances will demonstrate investment barrier,

Sr. No.	Criterion	Compliance Requirement	How the new project activity instances to comply
	and/or other barriers as the initial instances.	biomass-fired cookstoves; a. Efficient, solely renewable biomass-fired cookstoves that replace fossil fuel-fired cookstoves; or b. Electric cookstoves that replace inefficient biomass-fired or fossil fuel-fired cookstoves. 2. The project activity installs or distributes improved cookstoves at zero cost to the end user and has no revenue source other than from the sale of verified carbon units (VCUs). Step 3: Project Method - If the project activity is not on the positive list (Step 2), additionality must be demonstrated by applying a barrier analysis or investment analysis as per the most recent version of VT0008.	shall be Net present value (NPV). A specific project activity instance for which NPV is negative without VER revenue shall be deemed additional. Evidence of all costs/revenue in case the implementation has started, else reference of expected costs/revenue from earlier investment in similar projects. The project activity is additional and is described in section 3.5 of this document.

1.6 Project Proponent

Organization name	Bridge Carbon Africa Stoves Development Private Limited
Contact person	Dr. Donee Alexander
Title	Chief Carbon Officer
Address	38 Beach Road #29-11, South Beach Tower, Singapore 189767

Telephone	+65 6808 1600
Email	Carbon@bridgecarbon.com

1.7 Other Entities Involved in the Project

Bridge Carbon Africa Stoves Development Private Limited is the sole entity involved in the project and no other entity is part of the grouped project activity.

Organization name	Not applicable
Role in the project	Not applicable
Contact person	Not applicable
Title	Not applicable
Address	Not applicable
Telephone	Not applicable
Email	Not applicable

1.8 Ownership

The project is owned by Bridge Carbon Africa Stoves Development Private Limited

During the registration process, end users sign a registration certificate/consent deed that includes the statutory clause "Acknowledgement and Carbon Rights Waiver – My household hereby transfers and waives all and any rights in connection with the improved cookstove or project and greenhouse gas emission reductions or other environmental or social attributes generated by the installation and use of the improved cookstove to Bridge Carbon Africa Stoves Development Private Limited and we understand that Bridge Carbon Africa Stoves Development Private Limited may, at any time, transfer those rights to an affiliate without further notice or consent". This is in line with clause 5 of section 3.7.1 of VCS Standard v4.7

1.9 Project Start Date

Project start date	06-October-2020
Justification	As per VCS Standard version 4.7 section 3.8 "The project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or carbon dioxide removals", Hence the date of commissioning of first ICS under the grouped project activity 06-October-2020 is the start date.

1.10 Project Crediting Period

Crediting period	☐ Seven years, twice renewable ☒ Ten years, fixed ☐ Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)
Start and end date of first or fixed crediting period	06-October-2020 to 05-October-2030

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

Indicate the estimated annual GHG emission reductions (ERRs) of the project:

☒ < 300,000 tCO2e/year (project)

☐ ≥ 300,000 tCO2e/year (large project)

Complete the table below for the fixed crediting period:

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO_2e)
06-October-2020 to 31-December-2020	63[5]
01-January-2021 to 31-December-2021	14,434[5]
01-January-2022 to 31-December-2022	198,123[5]
01-January-2023 to 31-March-2023	64,847[5]
01-April-2023 to 31-December-2023	6,613
01-January-2024 to 31-December-2024	8,777
01-January-2025 to 31-December-2025	8,777
01-January-2026 to 31-December-2026	8,777

[5] Actual ERs from the previous monitoring period (from 06-Octobe 2020 to 31-March-2023) based on VMR0006 methodology.

01-January-2027 to 31-December-2027	8,777
01-January-2028 to 31-December-2028	8,777
01-January-2029 to 31-December-2029	8,777
01-January-2030 to 05-October-2030	6,685
Total estimated ERRs during the fixed crediting period	343,430
Total number of years	10
Average annual ERRs	34,343

1.12 Description of the Project Activity

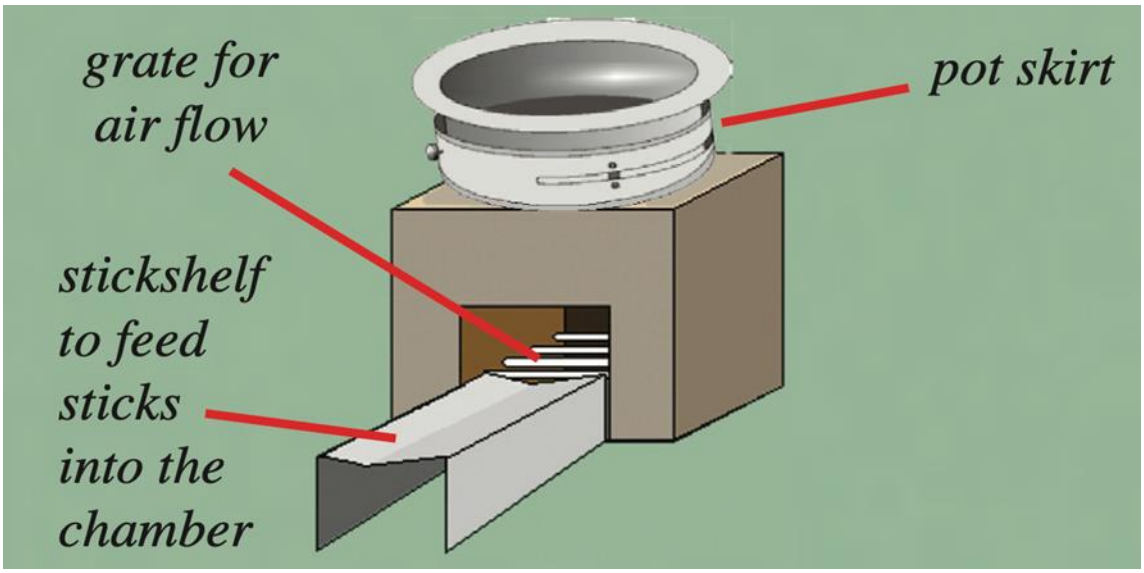
The project distributes fuel-efficient ICS to replace the baseline practice of burning wood in rudimentary cookstoves or three-stone fires in eligible households throughout rural Kenya.

The ICS's design leads to greater combustion efficiency and thermal transfer to the pot compared with a traditional cooking technologies by incorporating a 'rocket elbow'; a highly-insulated combustion chamber which provides a conducive environment for more complete combustion of wood. It substantially reduces fuel wood consumption compared to baseline.

Technology /Measure

TLC Rocket Stove uses a total of 15 bricks that are made using locally available clay (mixture of anthill soil, cow dung and sand). The average size of the brick is 22.5cm x 11cm x 6.5cm. The bricks are made from a mixture of five liters clay, five liters sand, five liters of manure/cow dung and five liters of water. This mixture creates insulating bricks, reducing heat loss. Metal

components have been added to the design to optimize combustion and heat transfer.



TLC Rocket Stove

Stove components

The stove has a metal top that allows the pot to sit higher improving airflow into the combustion chamber and out through the top of the stove

An adjustable metal pot skirt ensures more effective transfer of heat from the fire to the pot, increasing efficiency and also helping block wind.

TLC Rocket Stoves come with a metal stick support placed in front of and slightly into the opening of the stove. It acts as a firewood feeding platform. This ensures adequate airflow while feeding the fuel into the combustion chamber, resulting in more complete combustion of fuel wood.

According to independent stove efficiency tests performed by Aprovecho Research Center on the TLC Rocket Stove, the WBT results yielded an average thermal efficiency of 34.5%.

Technical Specification	
Stove Size	Depth: 35 cm Width: 35 cm Height: 28 cm
Combustion Chamber Size	Depth: 12 cm Width: 12 cm Height: 28 cm
Efficiency	34.5%
Average Life	10 years

Maintenance including replacement of stove parts as well as stoves, will be carried out as required to ensure that the stoves remain operational and in good condition throughout the crediting period of 10 years.

Data collection of ICS end-user

The PP gathers necessary information to identify households using its ICS during the project. To facilitate this each ICS is assigned a unique serial number. This number is recorded during the registration process together with the following information (as appropriate and as available):

- Name of ICS user or head of the household
- Address / GPS of ICS household
- Phone number of ICS user or household, where available.
- Stove model
- Date of distribution/installation
- ICS serial number
- Retailer/distributer information

The information collected is stored in an electronic database that serves as the project database for monitoring and sampling.

1.13 Project Location

The project location is the geographical boundary of Republic of Kenya with coordinates 0°1'24.8" S latitude and 37°54.372' E longitude[6]

[6] https://www.geodatos.net/en/coordinates/kenya

Kenya map[7]

1.14 Conditions Prior to Project Initiation

The condition prior to project initiation is the continued use of partially non-renewable wood fuel in rudimentary cookstoves or three-stone fires by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity.

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

The PP has gone through all the relevant laws and regulation in Kenya.

A review is made on Kenya environmental laws and regulations as below:

[7] http://www.mapsopensource.com/kenya-provinces-map.html

a. The Environment Management and Coordination Act, 1999

b. The Forests Act, 2005

c. The environmental (Impact Assessment and Audit) Regulations, 2003

d. The Climate Change Act No. 11 of 2016[8]

e. Climate Change (Carbon Markets) Regulations (2024)[9]

There are no mandatory government policies or regulations in the host country requiring the distribution of improved cookstoves. The project operates on a purely voluntary basis, with households choosing to participate without any legal obligation. Since there is no enforced law or statute mandating the use of efficient cookstoves. It is hereby confirmed that the proposed project is a voluntary coordinated action by PP.

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.16.2 Registration in Other GHG Programs

Has the project registered under any other GHG programs?

☐ Yes ☒ No

Is the project active under the other program?

☐ Yes ☒ No

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

1.17 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

[8] https://kenyalaw.org/kl/fileadmin/pdfdownloads/Acts/ClimateChangeActNo11of2016.pdf
[9] https://ke.chm-cbd.net/sites/ke/files/2024-05/LN%2084-CLIMATE%20CHANGE%20%28CARBON%20MARKETS%29%20REGULATIONS%2C%202024%20formatted.pdf

1.17.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit?

☐ Yes ☒ No

1.17.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system?

☐ Yes ☒ No

1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 1.12 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, "Carbon credits may be issued through Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities]."

☐ Yes ☒ No

1.18 Sustainable Development Contributions

Before the implementation of the project, households in the project location used non-renewable biomass for cooking on rudimentary cookstoves or three-stone fires. The project distributes fuel-efficient ICS to replace baseline cookstoves in households in Kenya, reducing firewood consumption and personal exposure to indoor air pollution. People, primarily women and children, spend less time collecting firewood, reducing drudgery. The implementation and construction of ICS have provided job opportunities to local people, increasing incomes. The

project reduces forest degradation and GHG emissions as well. Project activity will contribute to sustainable development goals (SDGs) described below.

SDG	Target	Indicator	Project Contributions – Justification
SDG 7 - Affordable and Clean Energy	7.1 By 2030, ensure universal access to affordable, reliable, and modern energy services.	7.1.1 Number of beneficiaries: Households.	The implementation and construction of ICS with thermal efficiency twice as high as traditional cookstove allows local communities to reduce their dependency on traditional cooking technology.
SDG 13 - Climate Action	13.2 Integrate climate change measures into national policies, strategies, and planning.	13.2.2 Total greenhouse gas emissions per year.	The Project is directly related to the target as it contributes towards avoidance of GHG emissions from replacing non-renewable biomass-based cooking.
SDG 15 - Life on Land	15.2 By 2030, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.	15.2.1 Progress towards sustainable forest management. Monitoring	ICS included in the project activity will reduce the consumption of non-renewable biomass in participant households and will contribute towards reducing forest degradation.

1.19 Additional Information Relevant to the Project

1.19.1 Leakage Management

Not applicable as the project adopts a net gross adjustment factor of 95% to account for leakage.

1.19.2 Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

1.19.3 Further Information

The project contributes to sustainable development in a number of ways:

(a) Environmental Sustainability

- The project helps significantly to reduce greenhouse gas emissions over its lifetime.
- The project helps to reduce the use of non-renewable biomass from forests, thus supports conserving existing forest stock and the protection of natural forest eco-systems and wildlife habitats.

(b) Social Sustainability

- Less time needs to be spent collecting wood fuel for the household, thereby reducing the work burden on rural families and presenting time savings for social activities, educational opportunities, or rest.
- Indoor air pollution from burning biomass in the household is reduced. Less particulate matter, carbon dioxide, carbon monoxide, and other pollutants are emitted due to the decrease in total biomass burned and more complete combustion.
- The stove provides a safer method for combusting biomass for cooking, helping to reduce burn injuries in the home.

(c) Economic Sustainability

- Household expenditures on cooking fuel are reduced through the use of the ICS.
- Saved household labour can be diverted to more productive economic activities.
- The project creates local employment opportunities in operational and management roles, as well as future assembly and/or manufacturing initiatives.

Project has registered for SDVista labeling, so detail of SDG impacts achieved by the project activity has provided in the SD Vista PD

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	Stakeholder identification is a continuous process aimed at verifying the necessity of engaging other entities interested and/or impacted by the project activities. Stakeholders can be directly impacted by the activities (beneficiary households) or interested in the project implementation due to their role in the communities and Country.
Legal or customary tenure/access rights	The implementation and construction of improved cookstoves does not require any kind of customary tenure/access rights since the project activity is based only on the dissemination of the cookstoves to local communities.
Stakeholder diversity and changes over time	Among the beneficiary households, no clear differences on social, economic, and cultural aspects have been detected, while the stakeholders indirectly involved in the project show different social and economic levels.
Expected changes in well-being	The most relevant expected improvements for stakeholder well-being are: *1)* reduced household air pollution, reducing the risk of disease, *2)* decreased perceived risk of gender-based violence and decreased risk of injury from carrying heavy loads for household members who collect fuelwood, *3)* increased savings on fuel cost (less fuel purchased), and *4)* time savings (less fuel collected).
Location of stakeholders	All stakeholders are operating and living in the project area, which is in the geographical boundary of Kenya. Further, this grouped project activity does not require relocation of any stakeholder, indigenous people, or local communities. The project does not lead to any negative impact outside the project boundary.
Location of resources	The project activity involves the implementation and construction of ICS to beneficiary households and resources owned by the stakeholders are not impacted by the project.

2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	The stakeholder consultation was conducted in between 26-October-2020 to 25-November-2020.
Stakeholder engagement process	Due to the COVID-19 pandemic, group gatherings were not allowed at the time in Kenya, thus, stakeholder feedback was collected electronically. Stakeholders were invited to provide feedback via multiple methods including an announcement posted on the PP's website on 26-October-2020, with an electronic feedback form, Project Description Presentation, and Non-Technical Summary. Furthermore, an English language advert ran in The Daily Nation, a major national newspaper, on 14-November-2020; and e-mail invitations were sent from PP on 4-November-2020 to 54 people from organizations around the country including government, NGOs, stove manufacturers, project developers, academia, and private and public-sector entities involved with cookstoves and/or sustainable energy. The email included a link to the PP website announcement and feedback form. Feedback was collected electronically from five additional stakeholders.
Consultation outcome	No negative feedback was received during the stakeholder's engagement period.
Ongoing communication	The PP follows three methods for continuous feedback and ongoing communications with stakeholders during project implementation. These are: **Annual Stove Champion visits and Performance Check visits to households** – Staff from Bridge Carbon's in-country team visits each registered household (ICS user) at least once per year. Usually, this stove champion visit is conducted within four months from the date of installation/registration. The objective of this visit is to ensure that project cookstoves are being properly used and to educate women on cookstoves maintenance, best practices, and benefits. The end user can use these visits to register complaints. In addition, the Bridge Carbon country team (leadership team, PSO, etc.) conducts performance check visits to registered households on a sample basis. One of the objectives of these visits is to ensure that the ground team is adequately addressing concerns from the beneficiaries and the end users are trained on the operation and maintenance of cookstoves and are aware of the benefits of the ICS.

	This performance check visit also addresses end user grievances and provides maintenance to cookstoves as needed. **Call over helpline number -** End Users can report their grievances and complaints regarding maintenance and/or malfunctioning of their stove or any of its parts, or any other issues by calling the helpline number. Bridge Carbon's ground team addresses grievances, failing which the Bridge Carbon country manager can pursue remedial action. **Through village chief/community leader/stove champion –** In view of the cultural obligations and individual level inhibitions, a provision has been made for end users to approach Bridge Carbon team through their village chief/community leader/stove champion with whom they might be more comfortable. The village chief/community leader/stove champion then channels the concern/issue to Bridge Carbon staff for resolution. This is undertaken to protect traditional sentiments and value systems of the villages and ensure end users can express issues or concerns without hesitation. As a part of on-going communication with all category stakeholders, it was explained during the LSC meeting that they are free to voice grievances regarding the project activity. Stakeholders are free to connect with the respective Bridge Carbon team anytime through the e-mail or contact number provided by PP. Any relevant concern received during the operation of project activity will be addressed according to its merit.
Stakeholder input	The PP has taken account of all the inputs received from the stakeholders during the consultation period. 1. User feedback in addition to monitoring parameters included in our project design documents will be collected during our monitoring processes. This is common practice for our projects, and 2. The project implementors will include stove types/technologies that they have already tested in the market and stove/fuel benefits and performance characteristics will be accurately presented to end-users. Comments received from stakeholders required no changes/updates to the project design.

2.1.3 Free Prior and Informed Consent

Obtaining consent	The participation of households in the project is free and voluntary. During stakeholder meetings it is highlighted that there is no enforcement or obligation to participate. Before delivering an ICS to an interested household, an End User Agreement is signed by a family member declaring that he/she is voluntarily taking part in the project activity. The project does not interfere with Indigenous People and Local Communities' rights.
Outcome of FPIC	The outputs of the stakeholder meetings shared in the section above clearly demonstrate that participants fully understand that their participation in the project is voluntary and that they are free to either take part in the project or decline participation. Indeed, no clarifications were requested in the household engagement procedure.

2.1.4 Grievance Redress Procedure

Development process	Stakeholders are requested to share their experiences and grievances on a continuous basis. A feedback register is used to record their grievances and feedback. The feedback register is kept at project site office where any stakeholder can come and register his/her feedback.
Grievance redress procedure	Grievances are noted and addressed with the relevant stakeholders through phone calls or site visits according to the level of reporting.

2.1.5 Public Comments

The following public comment was received during the public comment period from 28-October-2020 to 27-November-2020.

Comments received	Actions taken
This project does not qualify for carbon credits as the cook stoves are mere already existing tritonal cook stoves having not much efficient. They simply fools the HH user by adding few metallic parts.	Efficiency of the TLC rocket stove has been tested and approved by Aprovecho Research Center. Aprovecho Research Center specializes in testing biomass cooking stoves. They test stoves to understand how they function, to compare stoves, and to improve performance. The Water Boiling Test (WBT) and the nine metrics in the ISO/IWA Tiers provide the project

	manager with a holistic picture of emissions, fuel use, and safety. Aprovecho Research Center (ARC) assists developing world organizations to establish high quality labs so they can test and improve their wood burning cooking stoves. It specializes in iterative experimental design of wood burning cookstoves through rapid prototyping and emissions and thermal measurements.

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

Bridge Carbon (BC) is carbon project developer empowering vulnerable communities across sub-Saharan Africa and Southeast Asia to address climate change and drive sustainable development, through access to clean cooking, renewable energy, and ecosystem restoration solutions.

BC has a well-structured implementation team in place to conduct project activities. Bridge Carbon has numerous active projects under VERRA (VCS/SD Vista).

The management of BC are committed to developing high quality greenhouse gas emission reduction projects by providing fuel-efficient improved cookstoves to people in Kenya through carbon finance. BC brings world-class expertise in carbon management, operations, legal, and finance, and is committed to delivering carbon projects that deliver exceptional quality, integrity, and transparency.

2.2.2 Risk Assessment

	Risks identified	Mitigation or preventative measure(s) taken
Natural and human-induced risks to stakeholders' wellbeing	No risk identified	The project ICS has been designed to emit minimal amounts of smoke, avoiding fire hazards from malfunctions and significantly reducing fuelwood consumption to indirectly combat forest degradation. Additionally, the PP ensures that the end users receive adequate training in handling the ICS, mitigating risks to stakeholders' wellbeing.
Risks to stakeholder participation	No risk identified	There are no exclusions, lack of communication, or barriers in the project activity that might

		prevent stakeholders from engaging or participating.
Working conditions	No risk identified	The ICS provides a safer cooking alternative compared to traditional cookstoves. Additionally, comprehensive training sessions on ICS usage are conducted for stakeholders to minimize potential risks.
Safety of women and girls	No risk identified	In rural Kenya women and girls are mainly responsible for fuelwood collection. The reduction in fuelwood consumption with ICS reduces the time spent on fuelwood collection and potentially reduces the risk of gender-based violence.
Safety of minority and marginalized groups, including children	No risk identified	The project activity does not negatively affect the safety of minority and marginalized groups, including children.
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	No risk identified	Due to project activity, there is reduced risk from air pollutants and no risk of noise, discharges to water, generation of waste, or release of hazardous materials, chemical pesticides or fertilizers. The residual ash of burned firewood from cooking is eventually used to fertilize nearby soil.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified[10]	Mitigation or preventative measure(s) taken
Discrimination	No risk identified	The PP firmly condemns every form of discrimination based on gender, religion, or cultural differences. PP has implemented comprehensive policies and provided training to prevent and promptly address such issues. PP follows Part II – General Principles, – "Discrimination in employment" Section 5 (1,2,3) of "The Employment Act 2007[11]" of Kenya

[10] The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.
[11] https://www.labour.go.ke/sites/default/files/law/The_Employment_Act_2007.pdf

Sexual harassment	No risk identified	The PP has an established grievance mechanism system for staff and a "speak up" hotline they can call or email. The staff have been trained about harassment prevention and reporting. PP follows Part II – General Principles, – "Sexual harassment" Section 6 (1,2,3,4) of "The Employment Act 2007[12]" of Kenya
Equal pay for equal work	No risk identified	The PP has employed both men and women for equal work at equal pay. This holds true across Bridge Carbon, where the Executive Committee of six, three of whom are women. PP follows Part II – General Principles, "Discrimination in employment" Section 5 (4) of "The Employment Act 2007[13]" of Kenya
Gender equity in labor and work	No risk identified	Bridge Carbon provides equal opportunities to people of all genders. Any kind of gender-based discrimination is strictly forbidden. PP follows Part II – General Principles, – "Discrimination in employment" Section 5 (3) of "The Employment Act 2007[14]" of Kenya
Forced labor	No risk identified	No forced labor is involved in the project activity. PP follows Part II – General Principles, – "Prohibition against forced labour." Section 4 of "The Employment Act 2007[15]" of Kenya
Child labor	No risk identified	No child labor is involved in the project activity. PP follows Part VIII – Protection of Children, – "Prohibition of worst forms of child labour." Section 53 of "The Employment Act 2007[16]" of Kenya
Human trafficking	No risk identified	No human trafficking is involved in the project activity. PP follows Part II – General Principles, – "Prohibition against forced labour." Section 4 of "The Employment Act 2007[17]" of Kenya

[12] https://www.labour.go.ke/sites/default/files/law/The_Employment_Act_2007.pdf
[13] https://www.labour.go.ke/sites/default/files/law/The_Employment_Act_2007.pdf
[14] https://www.labour.go.ke/sites/default/files/law/The_Employment_Act_2007.pdf
[15] https://www.labour.go.ke/sites/default/files/law/The_Employment_Act_2007.pdf
[16] https://www.labour.go.ke/sites/default/files/law/The_Employment_Act_2007.pdf
[17] https://www.labour.go.ke/sites/default/files/law/The_Employment_Act_2007.pdf

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	The project activity is implementing ICS to beneficiaries free of charge (i.e., zero cost). Beneficiaries who received project ICS sign an agreement for their voluntary participation in the project activity. The project continues to recognize, respect, and promote the protection of the rights of the local community. The dissemination of the improved cookstove does not require any kind of customary tenure/access rights since the project activity is based only on the dissemination of the cookstoves to local communities. The PP ensure the application of all applicable laws, regulation, and international standards, including the Universal Declaration of Human Rights[18], United Nation Declaration on the Rights of Indigenous Peoples[19] (UNDRIP) and ILO Conventions are adhered to. The project activity does not interfere in any case with Indigenous People and Local Communities' rights.

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk identified	The project activity involves the implementation and construction of ICS to beneficiary's households; therefore, no tangible cultural heritage has been hampered by the project activity. Also, there have been no negative impacts of the project activity on the non-tangible cultural heritage of the stakeholders. Hence, the project continues to preserve and protect cultural heritage.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken

[18] https://www.ohchr.org/sites/default/files/Documents/Publications/fs9Rev.2.pdf
[19] https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf

No risk identified	This project involves the implementation and construction of ICS in beneficiary household and resources owned by stakeholders are not impacted by the project. Hence, no land/property of the stakeholders, IPs, LCs, and customary rights holders have been impacted by this project activity. Additionally, the project activity has obtained the free, prior and informed consent of the end users (beneficiaries including the IPs, LCs, and customary rights holders). This ensures that their land and property rights are protected and respected.

2.3.5 Benefit Sharing

Process used to design the benefit sharing plan	The benefit sharing plan is not applicable as project activity does not incur any risk related to property rights as explained in the previous section. Additionally, the project activity is completely based on implementation and construction of two ICS to each household where ICS are free of cost. If an ICS breaks, the PP will fix or replace the ICS. The ownership rights of carbon credits generated from this project are with Bridge Carbon. Bridge Carbon has signed end-user agreements with beneficiaries mentioning all the criteria before implementation of the project devices for entire crediting period.
Summary of the benefit sharing plan	Not Applicable
Approval and dissemination of benefit sharing plan	Not Applicable

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure(s) taken

Impacts on biodiversity and ecosystems	No risk identified	As the ICS consumes less firewood than baseline cooking technologies, it helps to reduce forest degradation. This reduction in demand for fuelwood allows forests to regenerate, protecting wildlife habitats and biodiversity.
Soil degradation and soil erosion	No risk identified	The ICS reduces the requirement for woody biomass, which means that less woody biomass is consumed for cooking. This decrease in reduces forest degradation, raising the amount of above-ground biomass in the nearby woods. Reduction in unsustainable harvesting of plant biomass could further reduce soil erosion associated with tree felling and improve biodiversity and species richness of the implementation area
Water consumption and stress	No risk identified	This grouped project activity involves implementation and construction of ICS and does not have any negative impacts on water consumption and does not lead to water stress in any way. Hence, this is not applicable.

2.4.1 Rare, Threatened, and Endangered Species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☐ Yes ☒ No

Species and habitat	Since the project activity involves the implementation and construction of ICS, which is not located in or adjacent to habitats for rare, threatened, or endangered species; hence, this is not applicable
Areas needed for habitat connectivity	Since the project activity involves the implementation and construction of ICS, which is not located in or adjacent to habitats for rare, threatened, or endangered species; hence, this is not applicable

	Risks identified	Mitigation or preventative measure(s) taken

Habitats for rare, threatened, and endangered species	No risk identified	The project activity involves the implementation and construction of ICS to people in rural areas of Kenya, which is not located in or adjacent to the areas needed for habitats for rare, threatened, and endangered species connectivity. Therefore, there are no risks associated with habitats for rare, threatened, and endangered species.
Areas for habitat connectivity	No risk identified	The project activity involves the implementation and construction of ICS to people in rural areas of Kenya, which is not located in or adjacent to the areas needed for habitats for rare, threatened, and endangered species connectivity. Hence, this is not applicable.

2.4.2 Introduction of Species

Species introduced	Classification	Justification for use	Adverse effects and mitigation
We are not introducing any live species, so there is no risk of introducing invasive species	N/A	N/A	N/A

Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species
Not applicable, the project activity is not related to planting or species introduction	N/A

	Risks identified	Mitigation or preventative measure(s) taken
Invasive species	No risk identified	No invasive species exist in the project area; therefore, there are no risks identified with the project activity.

2.4.3 Ecosystem Conversion

	Risks identified	Mitigation or preventative measure(s) taken

Ecosystem conversion	No risk identified	The project activity is neither ARR, ALM, WRC nor ACoGS; therefore, no risks associated with ecosystem conversion are identified with the project activity.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	VM0050[20]	Energy Efficiency and Fuel-Switch Measure in Cookstove.	1.0[21]
Tool	Tool 33[22]	Default values for common parameters	03.0

3.2 Applicability of Methodology

Methodology ID	Applicability condition	Justification of compliance
VM0050	The project activity corresponds to: a) Replacement of non-renewable biomass (e.g., firewood, charcoal)-fired cookstoves with any of the following: i. More efficient project devices that use the same fuel as in the baseline. ii. Efficient project devices fired by renewable biomass or bioethanol. iii. Efficient project devices fired by liquefied petroleum gas (LPG); or iv. Electric-powered project devices.	The project distributes fuel-efficient ICS to replace the baseline practice of burning wood in rudimentary cookstoves or three-stone fires in eligible households throughout rural Kenya. Hence, the condition of item a) i) is applicable.

[20] PP has sought the methodology deviation due to the inactive of methodology "VMR0006 Energy Efficiency and Fuel Switch Measures in Thermal Applications, Version 1.2" which has replaced by "VM0050 Energy Efficiency and Fuel-switch measures in Cookstoves, Version 1.0" on 09-October-2024 (Please refer Appendix 2: Project Description Deviation" for more detail).
[21] https://verra.org/wp-content/uploads/2024/10/VM0050-EE-and-Fuel-Switch-Measures-in-Cookstoves-v1.0.pdf
[22] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-33-v3.pdf

	b) Replacement of solid or liquid fossil fuel (e.g., coal, kerosene)-fired cookstoves with any of the following: i. Efficient project devices fired by renewable biomass or bioethanol. ii. Efficient project devices fired by LPG; or iii. Electric-powered project devices.	
VM0050	Project devices are used in households, communities, institutions, or small or medium enterprises (SMEs), collectively referred to in this methodology as the "target population."	The project distributes fuel-efficient ICS to replace the baseline practice of burning wood in rudimentary cookstoves or three-stone fires in eligible households throughout rural Kenya. Hence, this condition is applicable.
	Use of renewable biomass	
VM0050	Where renewable biomass is used, it is exclusively renewable and qualifies as one of the following: a. A by-product, residue, or waste stream from agriculture, forestry, and related industries; or b. Originating from dedicated plantations that comply with all relevant applicability conditions in the most recent version of CDM TOOL16.	This criterion is not applicable as project activity is not using renewable biomass as a fuel.
VM0050	Where biomass residues are used, they would have been left to decay or burned without energy recovery before implementation of the project activity, and their use does not involve a decrease in carbon pools – in particular of dead wood, litter, or soil organic carbon – on the land areas from which the biomass residues originate.	This criterion is not applicable as project activity is using non-renewable biomass and not a biomass residue as a fuel.
VM0050	Where biomass residues from a production process are used, project implementation does not result in an increase in the processing capacity of	This criterion is not applicable as project activity is using non-renewable biomass.

	raw input or any other substantial changes (e.g., product change) in this process.	
VM0050	Where more than one type of renewable biomass is used, each of the biomass types used complies with the applicability conditions.	This criterion is not applicable as project activity is using non-renewable biomass.
VM0050	Where project activities introduce renewable biomass as charcoal, it is renewable charcoal produced by efficient charcoal production processes6 (e.g., retort sedentary kilns, improved sedentary kilns, Casamance kilns). Methane produced during the charcoaling process is captured and destroyed or combusted for energy purposes.	This criterion is not applicable as project activity is using non-renewable biomass.
	Cookstove characteristics and use	
VM0050	Project devices using renewable biomass (fuel-switch) or non-renewable biomass (improved efficiency) are single-pot, multi-pot portable, or in-situ cookstoves with an initial thermal efficiency of at least 25%.	All ICS proposed are single pot stoves using fuelwood with a thermal efficiency of least 25%.
VM0050	Project devices using LPG or bioethanol are single-pot, multi-pot portable, or in-situ cookstoves with an initial thermal efficiency of at least 30%.	This condition is not applicable as project activity is ICS using non-renewable biomass.
VM0050	Electric project devices meet the maximum risk factor score of 15 on the Cookstove Durability Protocol and have the following minimum thermal efficiency: a. Hot plates and electric hobs: 40% b. Induction stoves and other electric stoves: 70%	This condition is not applicable as project activity is ICS using non-renewable biomass.
VM0050	Project devices using LPG comply with all of the following conditions: a. The baseline fuel either includes non-renewable biomass or is a more carbon-intensive fossil fuel	This condition is not applicable as project activity is ICS using non-renewable biomass.

	b. The project has a provision for metering LPG supplied to each consumer at the LPG filling station, in order to determine household LPG consumption; and c. The project does not seek to issue any carbon credits for periods after 31 December 2045.	
VM0050	Electric project devices use the following electricity sources: a. Decentralized renewable energy systems: Decentralized energy systems using fossil fuels are not eligible, except for backup generators that supply less than 1% of the annual electricity of the decentralized renewable energy system. b. Self-generated renewable electricity (with a maximum of 20% electricity from non-renewable sources for backup); or c. National or regional electricity grid.	This condition is not applicable as project activity is ICS using non-renewable biomass.
VM0050	The project proponent designs incentive mechanisms to reduce the use of inefficient baseline devices and practices that can be replaced by the project devices and describes these mechanisms in the project description.	Each household receives ICS free of cost. The mechanisms are implemented by the project proponent and includes trainings sessions. The training covers use and lessons on health and environmental awareness.
VM0050	Where a project device has ended its technical life, the project proponent either replaces it with a comparable or better project device or retrofits its essential components to continue meeting the minimum service level requirements (i.e., thermal energy generation), otherwise no further emission reductions may be claimed for the project device.	Maintenance including replacement of stove parts as well as stoves, is carried out as required to ensure that project stoves remain operational and in good condition throughout the crediting period of 10 years.
	Avoiding harm and double counting	

VM0050	Project proponents implement a method for the distribution and identification of project devices that avoids double counting of emission reductions by other mitigation actions and includes unique product identification on the stove itself at the time of distribution/sale (e.g., program logo, alpha/numeric ID, and end-user location, such as geographic coordinates, complete address information).	The proposed method of distribution will be door-to-door installations and/or through community events. Each ICS to be distributed/installed under this project activity will be marked with unique identification number (combination of alpha numeric code) in addition to details of date of installation, end user location and GPS co-ordinates.
VM0050	The project complies with any national, sub-national, or local regulations or guidance for the installation, commercialization, distribution, and use of improved cookstoves and/or fuel supply and use for the target population. National, regional, and local regulatory frameworks for the provision of the type of thermal energy services provided by the project activity must be documented.	There are no laws and regulations governing the use of improved cookstoves in Kenya households. The project is a voluntary effort by the project proponent.
VM0050	Where project activities reduce emissions from non-renewable biomass, including firewood and charcoal, the risk of double counting is assessed on a national basis by evaluating at validation and crediting period renewal whether there are REDD+ projects or jurisdictional REDD+ programs whose project boundary overlaps with the expected fuel source area of the project. The project proponent must report on the findings of this assessment for informational purposes in the project description.	This condition is not applicable as cookstoves will not be distributed to areas where REDD+ projects are executed, and the expected fuel source area of the project is not in conflict with such initiatives. Therefore, the risk of double counting is not relevant in this case.

Justification for applicability of clarification as per Correction and Clarifications to VM0050 Energy Efficiency and Fuel-switch Measures in Cookstoves, V1.0 are as follows:

Correction / Clarification	Description	Justification
Clarification 1	Baseline fuel consumption cross-checks	Cross check for baseline fuel consumption has been updated in section B.4 "Baseline Scenario" for VCS PD
Clarification 2	Usage rate caps	PP has considered the operational rate of 45.8%, as reported in the most recent MP MRV survey, compared to cap of 90% which is a conservative approach.
Clarification 3	Photographic evidence and usage rate	During usage rate monitoring survey team has taken the photographs of stove(s), its components, and the cooking areas. The same has been shown to VVB in DISCO system (BC inhouse data management system).
Clarification 4	Project stove efficiency and Water Boiling Tests (WBTs)	PP has chosen manufacturer-certified value that is determined via the Water Boiling Test and the test report has been submitted to VVB.
Clarification 5	Additional guidance on conducting Controlled Cooking Tests (CCTs)	Not Applicable, as Controlled Cooking Tests (CCTs) is related to Electric Project Devices with Additional Characteristics Affecting Energy Consumption
Clarification 6	Reference to equivalent standard male adult values	PP has applied the values of equivalent standard male adults from Correction and Clarifications to VM0050, v1.0
Clarification 7	Accepted sources of data for claiming wood-to charcoal conversion factor of up to 6:1	Not applicable, as project activity is ICS using non-renewable biomass.
Clarification 8	Stove condition and use questions	The non-operational stoves have been excluded from ER calculation for current monitoring period. During Stove Champion visit PP will repair/replace the stove which are not in good condition/operational. In case if the stoves are not repaired, they will be excluded from the database for entire crediting period.

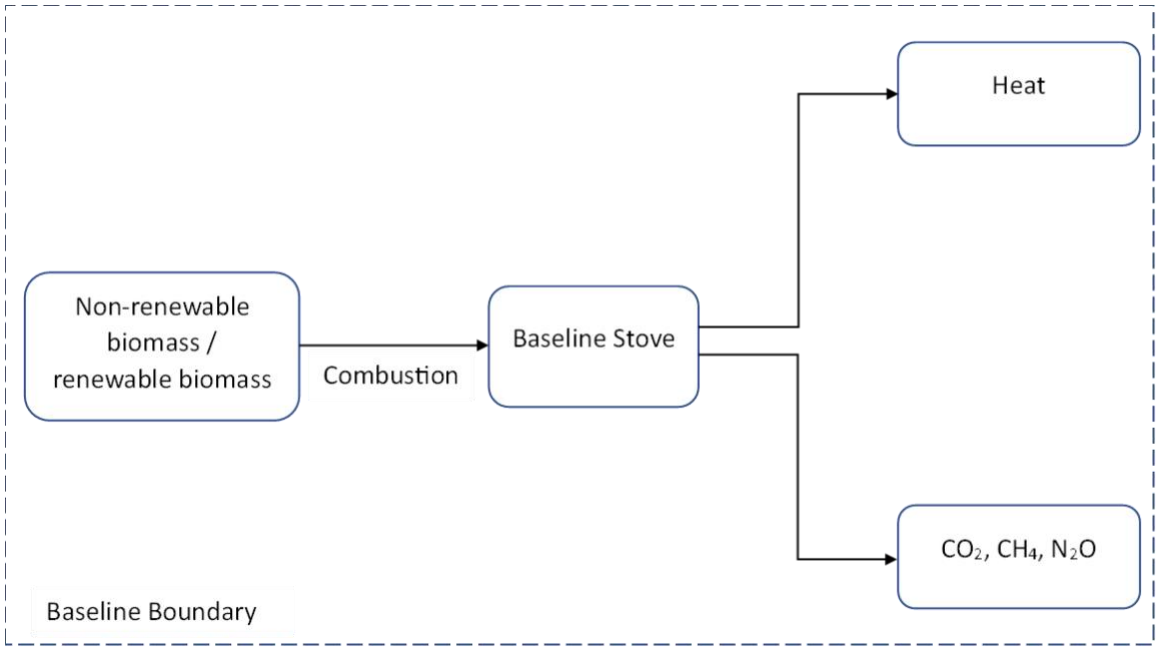
3.3 Project Boundary

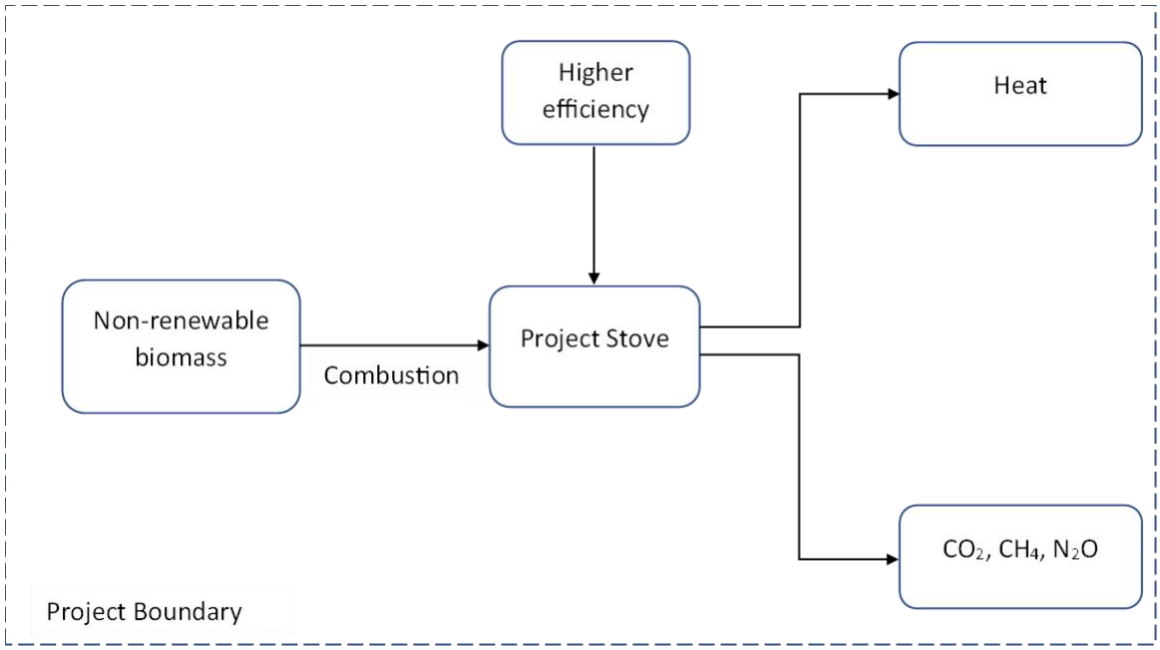
For Improved cook stoves, the project boundary is the physical, geographical site of the efficient devices that utilize non-renewable biomass.

Source		Gas	Included?	Justification/Explanation
Baseline	Thermal energy generation	CO_2	Yes	Major Source
		CH_4	No	Minor Source
		N_2O	No	Minor Source
		Other	No	No other source identified
	Production of charcoal fuel	CO_2	Yes	Major Source
		CH_4	Yes	May be significant for charcoal
		N_2O	Yes	May be significant for charcoal
		Other	No	No other source identified
Project	Thermal energy generation	CO_2	Yes	Major source
		CH_4	No	Minor source
		N_2O	No	Minor source
		Other	No	No other sources identified
	Transport of fuel (where applicable)	CO_2	No	Not accounted
		CH_4	No	Not accounted
		N_2O	No	Not accounted
		Other	No	No other sources identified
	Production of fuel	CO_2	No	Not accounted
		CH_4	No	Not accounted
		N_2O	No	Not accounted
		Other	No	No other sources identified
	Self-generated electricity (nonrenewable energy for backup)	CO_2	No	Not accounted
		CH_4	No	Not accounted
		N_2O	No	Not accounted
		Other	No	No other sources identified
	Grid electricity generation and distribution	CO_2	No	Not accounted
		CH_4	No	Not accounted
		N_2O	No	Not accounted

Source	Gas	Included?	Justification/Explanation
	Other	No	No other sources identified

A representation of the baseline boundary and project boundary are given as below.





3.4 Baseline Scenario

The baseline scenario under the implemented project activity is the continued use of non-renewable wood fuel (firewood) by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity.

The project activity was registered on 13-May-2022 under methodology VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves, version 1.1 and is undergoing transition to VM0050: Energy Efficiency and Fuel-Switch Measures in Cookstoves, v1.0 as per Verra Guidelines.

As per section 2.1.3 (2) of "Procedure to Change Methodology through a Project Description Deviation" v4.0 dated 16-October-2024, PP has applied the steps of new methodology (VM0050, v1.0) to determine the most plausible baseline scenario and to calculate baseline emissions for the remaining crediting period.

As per the VM0050 v1.0, Section 6.1, the selection and justification of the baseline scenario is completed in the following steps.

Step 1: Identify alternative baseline scenarios:

As per the latest available Demographic and Health Survey 2022[23], volume 1, published in June 2023, the detail of cooking technology and fuel are as follows.

1. Cooking Technology

a) 76.3% rural household using three-stone fire stove for cooking.

b) 9.6% rural household using clean fuel and technologies which constitutes LPG stove (8.8%), electric stove (0.1%), Piped natural gas stove (0.4%) and Biogas stove (0.2%).

2. Cooking Fuel

a) 88.4 % rural households using solid fuel for cooking which constitute wood (80.1%) and charcoal (7.7%).

[23] https://www.knbs.or.ke/wp-content/uploads/2023/08/Kenya-Demographic-and-Health-Survey-2022-Main-Report-Volume-1.pdf

Table 2.2 Household characteristics: Cooking

Percent distribution of households and de jure population by place for cooking, cooking technology, and cooking fuel, according to residence, Kenya DHS 2022

	Households			Population		
Characteristic	Urban	Rural	Total	Urban	Rural	Total
Place for cooking						
In the house	84.9	26.0	49.7	80.0	20.4	40.5
Separate room/kitchen	31.9	11.4	19.7	38.0	10.0	19.4
No separate room/kitchen	52.9	14.6	30.1	42.0	10.4	21.0
In a separate building	7.7	63.1	40.8	12.4	69.4	50.3
Outdoors	5.5	9.6	7.9	6.9	9.7	8.7
No food cooked in household	1.9	1.3	1.6	0.7	0.4	0.5
Total	100.0	100.0	100.0	100.0	100.0	100.0
Main cooking technology						
Clean fuels and technologies	**63.3**	**9.6**	**31.2**	**58.7**	**6.0**	**23.7**
Electric stove	0.4	0.1	0.2	0.3	0.1	0.2
LPG/natural gas stove	59.9	8.8	29.4	55.7	5.5	22.4
Piped natural gas stove	2.1	0.4	1.1	1.9	0.2	0.8
Biogas stove	0.3	0.2	0.2	0.3	0.1	0.2
Liquid fuel stove using alcohol/ ethanol	0.6	0.0	0.2	0.5	0.0	0.2
Other fuels and technologies	**34.8**	**89.1**	**67.2**	**40.6**	**93.6**	**75.8**
Liquid fuel stove not using alcohol/ethanol	8.4	0.6	3.7	6.5	0.2	2.3
Manufactured solid fuel stove	16.9	7.4	11.3	20.2	6.2	10.9
With a chimney	2.4	1.3	1.7	3.1	1.1	1.8
Without a chimney	14.5	6.2	9.5	17.1	5.1	9.1
Traditional solid fuel stove	0.7	4.7	3.1	0.8	5.5	3.9
With a chimney	0.2	1.5	1.0	0.2	1.8	1.3
Without a chimney	0.5	3.2	2.1	0.6	3.7	2.7
Three stone stove/open fire	8.8	76.3	49.1	13.1	81.7	58.6
No food cooked in household	**1.9**	**1.3**	**1.6**	**0.7**	**0.4**	**0.5**
Total	100.0	100.0	100.0	100.0	100.0	100.0
Cooking fuel						
Clean fuels and technologies[1]	**63.3**	**9.6**	**31.2**	**58.7**	**6.0**	**23.7**
Solid fuels for cooking	**26.2**	**88.4**	**63.3**	**34.0**	**93.3**	**73.4**
Charcoal	16.9	7.7	11.4	20.1	6.5	11.0
Wood	9.2	80.1	51.6	13.8	86.3	61.9
Straw/shrubs/grass	0.1	0.3	0.2	0.1	0.3	0.2
Agricultural crop	0.0	0.1	0.1	0.0	0.1	0.1
Sawdust	0.0	0.1	0.1	0.1	0.1	0.1
Other fuels	8.6	0.7	3.9	6.6	0.3	2.4
Gasoline/diesel	0.1	0.0	0.0	0.1	0.0	0.0
Kerosene/paraffin	8.4	0.7	3.8	6.5	0.3	2.4
No food cooked in household	**1.9**	**1.3**	**1.6**	**0.7**	**0.4**	**0.5**
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of households/population	15,277	22,634	37,911	47,730	94,296	142,026

LPG = liquefied petroleum gas
[1] Includes stoves/cookers using electricity, LPG/natural gas/biogas, solar, and alcohol/ethanol

Thus, based on the above data, cooking using wood fuel over traditional inefficient stoves is the prominent cooking practice. Since the PP provides improved cookstoves (ICS) exclusively to rural households that were previously using partially non-renewable wood fuel over three stone/conventional stoves as their primary baseline technology, all selected beneficiaries meet the baseline requirement of relying on non-renewable wood fuel in traditional inefficient cookstoves.

PP conducted the baseline surveys (KPTs from 07-April-2025 to 10-May-2025) in accordance with the KPT protocol and in line with the requirement of the methodology VM0050 v1.0.

According to the results of the baseline survey, households most frequently utilize non-renewable biomass-based cooking technology, mainly rudimentary cookstoves or three-stone fires.

Therefore, the baseline scenario is the continued use of traditional cookstove such as three stone-fired cookstove using non-renewable wood fuel (firewood) by the target population in rural areas to meet similar thermal energy needs as provided by project cookstoves in absence of project activity.

Step 2: Consider existing and forthcoming government policies and legal requirements:

The baseline identified above is consistent with existing or forthcoming laws, regulations or government policies. There are no known enforcement that focuses on replacing traditional cooking practices.

The Climate Change Act No. 11 of 2016[24] is the legislation from Kenya that establishes frameworks for building resilience, enhancing adaptive capacity to climate change, and regulating greenhouse gas emissions within the country. The Act mandates the formulation of a National Climate Change Action Plan, provides mechanisms for public participation, and empowers courts to take action against activities likely to harm climate change mitigation efforts.

The Climate Change (Carbon Markets) Regulations, 2024[25] refers to regulations enacted by countries like Kenya to establish frameworks for their carbon markets, focusing on the implementation of carbon projects, the reduction of greenhouse gas emissions, and meeting Paris Agreement commitments.

There are no mandatory government policies or regulations in the host country requiring the distribution of improved cookstoves. The project operates on a purely voluntary basis, with households choosing to participate without any legal obligation. Since there is no enforced law or statute mandating the use of efficient cookstoves. It is hereby confirmed that the proposed project is a voluntary coordinated action by PP.

Step 3: Financial, institutional, and information barriers:

Cookstoves that have a fuel other than non-renewable biomass or solid or liquid fossil fuels (e.g., electricity, solar thermal, renewable biomass, LPG) in the baseline scenario are excluded from the project activity.

As a result, the alternative scenario of implementing the project without GHG registration is not financially feasible and cannot be considered a realistic baseline alternative. Therefore, no alternate baseline scenarios exist as defined above.

[24] https://kenyalaw.org/kl/fileadmin/pdfdownloads/Acts/ClimateChangeActNo11of2016.pdf
[25] https://ke.chm-cbd.net/sites/ke/files/2024-05/LN%2084-CLIMATE%20CHANGE%20%28CARBON%20MARKETS%29%20REGULATIONS%2C%202024%20formatted.pdf

Financial barriers	a. Similar activities related to improving cooking efficiency have been implemented within the host country by considering the carbon revenue. The cost to transition to more efficient forms of cooking are higher than what the end-users are able to afford. b. There are no capital, grants or aid from domestic or international organisations available for clean cooking projects in the host country that might prevent the identified baseline scenario from occurring.
Information barriers	There is a lack of awareness of financial and non-financial benefits of ICS devices (energy efficiency/fuel saving) that require active awareness campaigns and engagement initiatives to boost adoption rates and behavioural change.
Institutional barriers	The high upfront capital needed for cookstove projects is not provided by the investors for implementation of project activity.

PP distributes improved cookstoves (ICS) free of cost to end-users, the project relies solely on revenue from the sale of Verified Carbon Units (VCUs) to sustain its operations. Without registration under a GHG program, the project would lack a financial mechanism to cover the costs of cookstove production, distribution, repair/maintenance and monitoring.

Thus, the remaining baseline scenario is the target population's continued use of traditional inefficient cookstoves/open fire with non-renewable firewood to meet similar thermal energy outputs for cooking as the project devices. Therefore, the project activity remains consistent with the defined baseline scenario, ensuring compliance with the methodology (VM0050, v1.0).

Established Controlled Households:

As per section 6.2 of VM0050, "For existing project updating to VM0050 methodology control household must be establish before the first verification under VM0050, v1.0."

The PP has defined the baseline households (KPT survey) as control households ensuring the pre-project condition of project household regarding the baseline in the same geographic area/ cooking practice. The control HHs are primarily using traditional cookstoves/open fire and wood fuel.

The sample size was determined in accordance with sampling approach of CDM guideline: Sampling and Surveys for CDM PA and PoA, version 4.0, This confirms that the selected households are statistically representative of the pre-project baseline conditions of the target population consistent with the controlled household requirements of VM0050 v1.0.

3.5 Additionality

3.5.1 Regulatory Surplus

Is the project located in an UNFCCC Annex 1 or Non-Annex 1 country?

☐ Annex 1 country ☒ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☐ Yes ☒ No

If the project is located inside a Non-Annex 1 country and the project activities are mandated by a law, statute, or other regulatory framework, are such laws, statutes, or regulatory frameworks systematically enforced?

☐ Yes ☒ No

3.5.2 Additionality Methods

As per applied methodology VM0050, v1.0, the positive list (activity method) is followed for the demonstration of project additionality and meet the following condition.

The project activity must meet both of the following conditions to qualify for the positive list:

1) The project activity introduces:
   a) Efficient biomass-fired cookstoves that replace inefficient biomass-fired cookstoves;
   b) Efficient, solely renewable biomass-fired cookstoves that replace fossil fuel-fired cookstoves; or
   c) Electric cookstoves that replace inefficient biomass-fired or fossil fuel-fired cookstoves.
2) The project activity installs or distributes improved cookstoves at zero cost to the end user and has no revenue source other than from the sale of verified carbon units (VCUs).

Justification:
The additionality of the project is established as the project satisfies the criteria stipulated in the guidelines extract presented above in following ways-

1. Project activity involves the distribution of fuel-efficient biomass-fired improved cookstoves (ICS) that replace inefficient biomass-fired cookstoves in households.

5) The ICSs are issued to beneficiary households at zero cost to the end user[26], hence PP has no other source of revenue other than the carbon credit generation.

Conclusion: As the project fulfils the conditions under Regulatory surplus & positive list of the applied methodology as descried above in Sec 3.5.1 & 3.5.2, it is deemed additional.

Project Method: (Provided during MP1 as a temporary deviation)

About 72%[27] of population in Kenya resides in rural areas and use traditional wood-fuel stoves for their daily need. Emissions of carbon monoxide (CO) are a significant percentage of the emissions

[26] Other than the regulatory surplus and positive list, as a temporary deviation during MP1, PP has demonstrated project method through NPV analysis to confirm the additionality of each project activity instances, where PP has other sources of revenue except carbon credit sales. (The same has been provided under the project method for reference in VCS PD)
[27] Rural population (% of total population) - Kenya | Data (worldbank.org)

of traditional wood-fuel stoves. Inefficient Cookstoves increases the risk of disease and death, particularly among women and children. Use of improved cookstoves will reduce indoor air pollution levels and the health risks associated with breathing products of combustion during cooking. Conventional cookstoves are inefficient, using large quantities of wood fuel. The improved cookstoves burn biomass more efficiently, consuming less woody biomass to accomplish the same cooking needs.

However, several barriers exist to improved cookstove projects resulting in low adoption, especially in rural areas despite massive promotion over many decades. Existing research suggests that cost is a main deterrent as most of the end users; in particular in rural populations. There are other factors too, such as perceived difficulty in usage, uncertainty in after sale maintenance etc. To ensure that the cookstoves implemented under a project activity instance are adopted and continue to be used by the end users, the project proponent must ensure that the above-mentioned barriers are taken care of, such as highly subsidizing the stoves, providing continued maintenance and usage guidance and ensuring proper supply chain of processed renewable biomass in case the stove uses processed fuel. All these measures require considerable investment on part of the investor. The benefit in terms of energy savings is passed on directly to the end user and the investor can expect returns only from sale of Certified Emission Reductions (CERs).

Thus, for each project activity instance implemented under the present grouped project which sells the ICS at subsidised cost, there exists an investment barrier which shall be established according to tool 21-"Demonstration of additionality of small -scale project activities; Version 13.1. In addition, guidelines stated under paragraph 4.3 of 'Tool for the demonstration and assessment of additionality'; version 07.0, shall be followed to demonstrate that the project activity instance will not be economically or financially feasible, without the revenue from the sale of CERs.

A financially more viable alternative to the project activity would be the continued use of baseline stoves as these are usually built by the end users themselves using locally available materials or, even if bought, cost much less compared to the project ICS.

The financial indicator against which the project activity instances will demonstrate investment barrier, shall be Net present value (NPV). A specific project activity instance for which NPV is negative without VER revenue shall be deemed additional.

The following is the list of parameters using which investment analysis can be carried out.

Implementation Costs

Input Values		Value	Evidence
1	Stove cost (per ICS)	$6.00	Quotation received from Ener-G-Africa (Stove parts supplier) in September 2020
2	Distribution Cost (per ICS)	$4.50	Contract/ term sheet signed with implementing partner in August 2020

3	Operations and Maintenance Cost (per ICS per year)	$1.50	Contract/ term sheet signed with implementing partner in August 2020
4	Total ICS installed (projected)	125,000 each for 4 years	Project implementation plan
Cost involving software/ Database Maintenance			
5	Software development (one time)	$4,850	Invoice raised by Software developer
6	Database management (recurring)	$480	Invoice raised by Software developer
Other Cost			
7	Cost on account of defective stove/breakdown (From year 2 onwards)	$ 37,500	Calculated based on 5% replacement every year

The following are the project income sources.
Project Revenue

1	Revenue from the sale of bricks used for ICS	$2.76	internal communication with implementing partners (300 Kenyan Shilling charged per ICS)
2	Revenue from the sale of VCUs		
	Price of VCUs	$4.00	https://www.aircarbon.co/
	Number of expected VCUs	985,327	In 1st Year (estimated as per VCS-PD)

Actual values of the above variables shall be applied for a project activity instance which has selected investment analysis for demonstrating additionality. However, the above list of variables is not binding for each project activity instance and actual costs and expenses will determine the outcome of investment analysis.

Discount rate shall be derived in accordance with paragraph 38 of CDM Tool 1 -'Tool for the demonstration and assessment of additionality'; version 07.0.

For each specific project activity instance under this Grouped Project activity, negative NPV value confirms that from project implementer(s) perspective, considering the upfront capital requirements towards stove manufacture and costs related to distribution and project monitoring as well as the associated risk of CER delivery, poses a considerable investment barrier.

Additionality for present project activity
For any project activity instance where stoves are not provided at zero cost to the end-user or has any other source of revenues other than the sale of GHG credits, then the project activity shall apply investment analysis method set out in the CDM Tool for the Demonstration and Assessment of Additionality included in AMS-II.G to determine that the proposed project activity is either: 1) not the most economically or financially attractive, or 2) not economically or financially feasible.

3.6 Methodology Deviations

Not Applicable

4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

As per VM0050, baseline emissions are calculated as follows:

$$BE_y = \sum_{i,j,k} EC_{i,y} \times N_{j,k,y} \times n_{j,k,y} \times \left(EF_{b,i,CO2} \times f_{NRB,y} + EF_{b,i,nonCO2}\right) \quad (1)$$

Where,

BE_y	=	Baseline emissions during year y (t CO_2e)
$EC_{i,y}$	=	Average energy consumption of baseline device type i in year y (TJ)
$N_{j,k,y}$	=	Number of commissioned project devices of type j from batch k in year y
$n_{j,k,y}$	=	Proportion of commissioned project devices of type j from batch k that remain operating in year y (fraction)
$EF_{b,i,CO2}$	=	CO_2 emission factor for fuel used by baseline device type i in the baseline scenario (t CO_2/TJ)
$f_{NRB,y}$	=	Fraction of woody biomass that is established to be non-renewable used by baseline device in year y; this variable is not considered for fossil fuels (fraction)
$EF_{b,i,nonCO2}$	=	Non-CO_2 emission factor for fuel used by baseline device type i in the baseline scenario (t CO_2e/TJ)
i	=	Baseline device type and its respective fuel type
j	=	Project device type and its respective fuel type

The average energy consumption of baseline device type i is calculated as follows:

$$EC_{i,y} = BC_{b,i,y} \times NCV_{b,i} \quad (2)$$

Where:

$BC_{b,y,i,j}$	=	Fuel used per baseline device type i during year y (tonnes)
$NCV_{b,i}$	=	Net calorific value of baseline fuel for baseline device type i (TJ/tonne)

The quantity of fuel that would be used in the baseline scenario must be determined by one of the following two methods.

Option 1: Measurement campaign

A measurement campaign must be conducted following the procedures in the most recent version of the Kitchen Performance Test Protocol. Appendix 4 of VM0050 methodology provides further guidance on measurement techniques. The sampling must comply with the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities. The campaign must achieve confidence and precision of at least 90/10 for the target parameter of average daily fuel consumption per adult equivalent. The result must be scaled appropriately using the average household size (Hh_i) to obtain the value of $BC_{b,i,y}$. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities. Energy consumption calculated using this option must be determined once prior to validation to obtain $BC_{ex\text{-}ante,b,i}$.

Option 2: Default values

$EC_{i,y}$ is calculated based on the default value for the average annual consumption of woody biomass per person for cooking:

- Firewood: 0.5 tonnes/capita/year of air-dried wood
- Charcoal: 0.13 tonnes/capita/year

Where fuels other than firewood or charcoal are also used in the baseline, their energy use must be accounted for in equivalent terms to the values above.

The PP has chosen option 1 to calculate $BC_{b,i,y}$

The result must be scaled appropriately using the average household size (Hhi) to obtain the value of $BC_{b,i,y}$.

Follow-up baseline surveys must be conducted every five years in control households that do not participate in the project. These households must be established prior to validation as statistically equivalent to the pre-project conditions of project households regarding fuel consumption. Where the biennial follow-up baseline survey campaigns reflect statistically significant changes to the baseline, baseline energy consumption must be updated (using a new measurement campaign conducted in control households) to obtain $BC_{b,i,y}$.

Cross-check of $EC_{i,y}$ to address stove stacking:

Project proponents must address stove stacking (continued use of pre-project devices in project households) by comparing the quantity of baseline energy consumption determined by both options above ($EC_{i,y}$) to energy used in the project scenario ($EC_{p,y}$) using back-calculation. Where the results indicate that baseline consumption ($EC_{i,y}$) is higher than that indicated by back-calculation from the project scenario ($EC_{est,y}$) then stove stacking is occurring (as $EC_{p,y}$ is unable to completely capture household energy consumption from cooking due to the presence/use of pre-project devices). The back-calculation results ($EC_{est,y}$) must be applied in Equation (1) as a conservative cap, except where project devices are electric cooking devices with efficiency of 70% or higher. In this case, the back-calculation result is considered a reference value and project proponents may justify why it is not an appropriate cap by referring to peer-reviewed literature, third party assessments, and/or official data or statistics. Where it is not possible to

justify energy use using these sources of information, the reference value must be applied as a conservative cap for such cases as well.

$$EC_{est,y} = EC_{p,y} \times \frac{\eta_{new,avg,y}}{\eta_{old,avg}} \quad (3)$$

Where:

$EC_{est,y}$	=	Back-calculated energy consumption of the potential mix of devices and fuels in the baseline in year y (TJ)
$EC_{p,y}$	=	Energy used in project scenario by project devices during year y (TJ)
$\eta_{new,avg,,y}$	=	Weighted average efficiency of project devices in year y (fraction)
$\eta_{old,avg}$	=	Weighted average efficiency of baseline devices that are replaced by project devices (fraction)

$EC_{p,y}$ must be determined as follows

$$EC_{p,,y} = \sum_{i,k} BC_{p,j,k,y} \times NCV_{p,j} \quad (4)$$

Where:

$BC_{p,j,k,y}$	=	Average quantity of fuel used by project device type j from batch k during year y (tonnes)
$NCV_{p,j}$	=	Net calorific value of project fuel used in project device type j (TJ/tonne)

4.2 Project Emissions

As per VM0050, project emissions are calculated as follows:

$$PE_y = PE_{energy,y} + PE_{others,y} \quad (6)$$

Where:

PE_y	=	Project emissions during year y (t CO_2e)
$PE_{energy,y}$	=	Project emissions from energy consumption of project devices in year y (t CO_2e)
$PE_{others,y}$	=	Project emissions from other sources in year y (t CO_2e)

Project emissions from energy consumption of project devices using biomass, fossil fuels, or bioethanol in year y is calculated as follows:

$$PE_{energy,y} = \sum_{j} \sum_{k} BC_{p,j,k,y} \times N_{j,k,y} \times NCV_{p,j} \times n_{j,k,y} \times \left(EF_{p,j,CO2} \times f_{NRB,y} + EF_{p,j,nonCO2}\right) \quad (7)$$

Where:

$BC_{p,j,k,y}$	=	Average quantity of fuel used by project device type j from batch k during year y (tonnes)
$N_{j,k,y}$	=	Number of commissioned project devices of type j from batch k in year y
$n_{j,k,y}$	=	Proportion of commissioned project devices of type j from batch k that remain operating in year y (fraction)
$NCV_{p,i}$	=	Net calorific value of project fuel used in project device type j (TJ/tonne)
$EF_{p,j,CO2}$	=	CO_2 emission factor for fuel used by project device type j in the project scenario (t CO_2/TJ)
$f_{NRB,y}$	=	Fraction of woody biomass that is established to be non-renewable used by baseline device in year y; this variable is not considered for fossil fuels (fraction)
$EF_{p,j,nonCO2}$	=	Non-CO_2 emission factor for fuel used by project device type j (t CO_2e/TJ)

Calculation of $BC_{p,j,k,y}$ for Project Devices:

There are three approaches to calculating $BC_{p,j,k,y}$.

Option 1: Kitchen Performance Test

A measurement campaign following the Kitchen Performance Test Protocol must be designed, carried out, and analyzed in compliance with the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities. The campaign must achieve a confidence and precision of at least 90/10 for the target parameter of average daily fuel consumption per adult equivalent. Only the results for project stove fuel consumption are used to calculate project emissions. The result must be scaled appropriately using the average household size ($Hh_{j,k}$) to obtain the value of $BC_{p,j,k,y}$. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per Section 4 of the most recent version of CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities.

Option 2: Direct measurement

Use direct measurement with equipment calibrated in accordance with national/international requirements. A sample of project devices may be measured such that a confidence and precision of 90/10 is achieved for the target parameter of total annual fuel use. The sampling must comply with the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per Section 4 of the most recent version of CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities.

Option 3: Fuel purchase monitoring (only for project devices using fossil fuels or bioethanol)
Where applying this option, the project proponent must:

1) keep continuous records of all fuel purchases (e.g., fuel purchase invoices from the supplier).

2) ensure fuel is used only for thermal energy generation by the project device (e.g., by using a fuel cylinder design that may only be attached to the project device).

The PP has chosen option 1 to calculate $BC_{p,j,k,y}$

Calculations of $PE_{others,y}$ from Transportation, Fuel Production, Fugitive Emissions, and Backup Generators are calculated as follows

$$PE_{others,y} = PE_{transp,y} + PE_{prod,y} + PE_{fugitive,y} + PE_{backup,y} \quad (9)$$

Where,

$PE_{transp,y}$	=	Project emissions due to fuel transportation in year y (t CO_2e)
$PE_{prod,y}$	=	Project emissions due to fuel production in year y (t CO_2e)
$PE_{fugitive,y}$	=	Fugitive emissions in year y (t CO_2e)
$PE_{backup,y}$	=	Project emissions from backup generators in year y (t CO_2e)

Project emissions from fuel transportation ($PE_{transp,y}$)
Average fuel transportation distance is less than 200 km. Hence, project emissions from fuel transportation is considered as Zero.

Project emissions from fuel production ($PE_{prod,y}$)
This is not applicable as there are no emissions resulting from soil management, cultivation, thermal/mechanical processing, and biomass burning associated with fuel production.

Fugitive emissions ($PE_{fugitive,y}$)
This is not applicable as there is no release of methane.

Project emissions from backup generators ($PE_{backup,y}$)
No project devices use electricity from a mini grid with backup generators. Hence, not applicable.

4.3 Leakage Emissions

For a Leakage emissions associated with reduced or avoided use of non-renewable biomass an adjustment factor of 0.95 is applied to the GHG emission reductions in Equation (11) of section 8.3 (point 1) of methodology (i.e., 0.95 × (BEy − PEy)).

4.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

Net GHG emission reductions are calculated as follows:

Calculation of Baseline Emission: Sample calculation from 01-April-2023 to 31-December 2023 are as follows:

Assumption			
Sr. No,	**Parameter**	**Unit**	**Value**
1	Average household size of the target population using device type i (Hh_i)	Male adult Equivalent	3.2663

2	Average household size of the target population using device type j from batch k ($Hh_{j,k}$)	Male adult Equivalent	3.2436
3	Fuel used per baseline device type i during year y	kg/capita/day	2.1967
4	Average quantity of fuel used by project device type j from batch k during year y	kg/capita/day	1.8771
5	Fuel used per baseline device type i during year y ($BC_{i,y}$)	tonnes/HH /year	2.6188
6	Average quantity of fuel used by project device type j from batch k during year y ($BC_{p,j,k,y}$)	tonnes/HH /year	2.2224
7	Fuel saving-Firewood	tonnes/HH /year	0.40
8	Fraction of woody biomass that is established to be non-renewable used by device in year y (f_{NRB})	fraction	0.29
9	Proportion of commissioned project devices of type j from batch k that are still being used regularly in year y ($n_{j,k,j}$)	fraction	0.594
10	Number of commissioned project devices of type j from batch k in year y - HHs ($N_{j,k,y}$)	Count	59,969

$$BE_y = \sum_{i,j,k} EC_{i,y} \times N_{j,k,y} \times n_{j,k,y} \times \left(EF_{b,i,CO2} \times f_{NRB,y} + EF_{b,i,nonCO2}\right) \quad (1)$$

Parameter	Description	Value	Unit
BE_y	Baseline emissions during year y	61,034	t CO_2e
$EC_{i,y}$	Average energy consumption of baseline device type i in year y	0.04096	TJ
$N_{j,k,y}$	Number of commissioned project devices of type j from batch k in year y	59,969	number
$n_{j,k,j}$	Proportion of commissioned project devices of type j from batch k that remain operating in year y	0.59	fraction
$EF_{b,i,CO2}$	CO_2 emission factor for fuel used by baseline device type i in the baseline scenario	112	t CO_2/TJ
f_{NRB}	Fraction of woody biomass that is established to be non-renewable used by baseline device type i in year y in the baseline scenario (fraction); this variable is not considered for fossil fuels	0.29	fraction
$EF_{b,i,nonCO2}$	Non-CO_2 emission factor for fuel used by baseline device type i in the baseline scenario	9.46	t CO_2e/TJ

$$EC_{i,y} = BC_{b,i,y} \times NCV_{b,i} \quad (2)$$

Parameter	Description	Value	Unit
$EC_{i,y}$	Average energy consumption of baseline device type i in year y	0.0410	TJ

$BC_{i,y}$	Fuel used per baseline device type i during year y (tonnes)	2.6188	tonnes
$NCV_{b,i}$	Net calorific value of baseline fuel for baseline device type i	0.0156	TJ/tonne

$$EC_{est,y} = EC_{p,y} \times \frac{\eta_{new,avg,y}}{\eta_{old,avg}} \quad (3)$$

Parameter	Description	Value	Unit
$EC_{est,y}$	Back-calculated energy consumption of the potential mix of devices and fuels in the baseline in year y	0.0800	TJ
$EC_{p,y}$	Energy used in project scenario by project devices during year y	0.0348	TJ
$\eta_{new,avg,,y}$	Weighted average efficiency of project devices in year y	0.3450	Fraction
$\eta_{old,avg}$	Weighted average efficiency of baseline devices that are replaced by project devices	0.15	Fraction

$$EC_{p,,y} = \sum_{i,k} BC_{p,j,k,y} \times NCV_{p,j} \quad (4)$$

Parameter	Description	Value	Unit
$EC_{p,y}$	Energy used in project scenario by project devices during year y	0.0348	TJ
$BC_{p,j,ky}$	Average quantity of fuel used by project device type j from batch k during year y	2.2224	tonnes
$NCV_{p,i}$	Net calorific value of baseline fuel for project device j	0.0156	TJ/tonne

Calculation of Project Emission:

$$PE_y = PE_{energy,y} + PE_{others,y} \quad (6)$$

Parameter	Description	Value	Unit
PE_y	Project emissions during year y	51,795	t CO_2e
$PE_{energy,y}$	Project emissions from energy consumption of project devices in year y	51,795	t CO_2e
$PE_{others,y}$	Project emissions from other sources in year y	0	t CO_2e

$$PE_{energy,y} = \sum_{j} \sum_{k} BC_{p,j,k,y} \times N_{j,k,y} \times NCV_{p,j} \times n_{j,k,y} \times \left(EF_{p,j,CO2} \times f_{NRB,y} + EF_{p,j,nonCO2}\right) \quad (7)$$

Parameter	Description	Value	Unit
$PE_{energy,y}$	Project emissions from energy consumption of project devices in year y	51,795	t CO_2e
$BC_{p,j,k,y}$	average quantity of fuel used by project device type j from batch k during year y	2.2224	tonnes
$N_{j,k,y}$	Number of commissioned project devices of type j from batch k in year y	59,969	number
$n_{j,k,j}$	Proportion of commissioned project devices of type j from batch k that remain operating in year y	0.594	fraction

$NCV_{p,j}$	Net calorific value of project fuel for project device type i (Wood)	0.0156	TJ/tonne
$EF_{p,j,CO2}$	CO_2 emission factor for fuel used by project device type j in the project scenario	112	t CO_2/TJ
f_{NRB}	Fraction of woody biomass that is established to be non-renewable used by baseline device type i in year y in the baseline scenario (fraction); this variable is not considered for fossil fuels	0.29	fraction
$EF_{p,j,non-CO2}$	Non-CO_2 emission factor for fuel used by project device type j	9.46	t CO_2/TJ

Net GHG emission reductions are calculated as follows:

$$ER_y = (BE_y - PE_y) \times 0.95 - LE_{RB,y} \quad (11)$$

Parameter	Description	01-January-2023 to 31-December-2023	01-April-2023 to 31-December-2023[28]	Unit
ER_y	Emission reductions during year y	8,777	6,613	t CO_2e
BE_y	Baseline emissions during year y	61,034	45,985	t CO_2e
PE_y	Project emissions during year y	51,795	39,023	t CO_2e
LE_{RBy}	Leakage emissions associated with use of renewable biomass during year y	0	0	t CO_2e

Note: Please refer ER calculation sheet for estimated emission reduction for crediting period 06-October-2020 to 05-October-2030

For projects that are not required to assess permanence risk, complete the table below for the project crediting period:

Vintage period	Estimated baseline emissions (tCO_2e)	Estimated project emissions (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated reduction VCUs (tCO_2e)	Estimated removal VCUs (tCO_2e)	Estimated total VCUs (tCO_2e)
06-October-2020 to 31-December-2020	63[29]	0	0	63	0	63
01-January-2021 to 31-December-2021	14,434[29]	0	0	14,434	0	14,434

[28] Apportioned value for from 01-April-2023 to 31-December-2023.

[29] Actual ERs from the previous monitoring period (from 06-October 2020 to 31-March-2023) based on VMR0006 methodology.

01-January-2022 to 31-December-2022	198,123[29]	0	0	198,123	0	198,123
01-January-2023 to 31-March-2023	64,847[29]	0	0	64,847	0	64,847
01-April-2023 to 31-December-2023	45,985	39,023	0	6,613	0	6,613
01-January-2024 to 31-December-2024	61,034	51,795	0	8,777	0	8,777
01-January-2025 to 31-December-2025	61,034	51,795	0	8,777	0	8,777
01-January-2026 to 31-December-2026	61,034	51,795	0	8,777	0	8,777
01-January-2027 to 31-December-2027	61,034	51,795	0	8,777	0	8,777
01-January-2028 to 31-December-2028	61,034	51,795	0	8,777	0	8,777
01-January-2029 to 31-December-2028	61,034	51,795	0	8,777	0	8,777
01-January-2030 to 05-October-2030	46,486	39,449	0	6,685	0	6,685
Total	736,143	389,241	0	343,430	0	343,430

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$NCV_{b,i}$ $NCV_{p,j}$
Data unit	TJ/tonne
Description	Net calorific value of baseline fuel used by baseline device type i Net calorific value of project fuel used by project device type j
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1 Introduction
Value applied	0.0156
Justification of choice of data or description of measurement methods and procedures applied	Use of default values from the most recent version of the IPCC Guidelines for National Greenhouse Gas Inventories
Purpose of Data	Calculation of baseline and project emission.
Comments	No Comments

Data / Parameter	$BC_{ex\text{-}ante,b,i}$
Data unit	tonnes
Description	Ex-ante annual average quantity of fuel used per baseline device type i
Source of data	Option 1: A measurement campaign following the Kitchen Performance Test Protocol must be designed, carried out, and analyzed in compliance with the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities. The campaign must achieve a confidence and precision of at least 90/10 for the target parameter of average daily fuel consumption per adult equivalent. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per Section 4 of the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities. The result must be scaled appropriately using the average household size to obtain the value of $BC_{ex\text{-}ante,b,i}$.
Value applied	2.6188 tonnes/HH/year
Justification of choice of data or description of	N/A

measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions
Comments	Energy consumption must be determined once prior to validation.

Data / Parameter	$EF_{b,i,CO2}$ $EF_{p,j,CO2}$
Data unit	tCO_2/TJ
Description	CO_2 emission factor for fuel used by baseline device type i in the baseline scenario. CO_2 emission factor for fuel used by project device type j in the project scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion
Value applied	112
Justification of choice of data or description of measurement methods and procedures applied	Use of default values from the most recent version of the IPCC Guidelines for National Greenhouse Gas Inventories
Purpose of Data	Calculation of baseline and project emission.
Comments	No Comments

Data / Parameter	$EF_{b,i,non\ CO2}$ $EF_{p,j,non\ CO2}$
Data unit	tCO_{2e}/TJ
Description	Non-CO_2 emission factor for fuel used by baseline device type i in the baseline scenario. Non-CO_2 emission factor for fuel used by project device type j in the project scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion
Value applied	9.46
Justification of choice of data or description of	Use of default values from the most recent version of the IPCC Guidelines for National Greenhouse Gas Inventories (AR5 GWP)

measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emission
Comments	No Comments

Data / Parameter	$\eta_{old,avg}$
Data unit	Fraction
Description	Weighted average efficiency of baseline devices that are replaced by project devices.
Source of data	Methodological default value
Value applied	0.15
Justification of choice of data or description of measurement methods and procedures applied	For three-stone fire using firewood or a cookstove with no improved combustion air supply or flue gas ventilation, default value of 15% as per applied methodology VM0050, v1.0
Purpose of Data	Calculation of baseline emissions
Comments	No Comments

Data / Parameter	Hh_i $Hh_{j,k}$
Data unit	Equivalent standard male adults
Description	Average household size of the target population using device type i Average household size of the target population using device type j from batch k
Source of data	Baseline and project survey[30] The campaign must achieve a confidence and precision of at least 90/10 for the target parameter of average household size.
Value applied	Hh_i:3.2663 $Hh_{j,k}$: 3.2436

[30] as per KPT survey

Justification of choice of data or description of measurement methods and procedures applied	Recognized survey methods based on the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities
Purpose of Data	Estimation of average energy consumption when applying Option 1: Measurement campaign (Section 8.1.1 of applied methodology VM0050 V1.0)) Cross-checking energy and fuel consumption values
Comments	This parameter must be determined ex ante via the baseline survey as described in Section 6.2 of applied methodology VM0050, v1.0. Note: Values in this table are considered from KPT assessment.

5.2 Data and Parameters Monitored

Data / Parameter	$N_{j,k,y}$
Data unit	Number
Description	Number of commissioned project devices of type j from batch k in year y
Source of data	Monitoring
Description of measurement methods and procedures to be applied	The following data are recorded during project activity implementation: 1) Number of new devices distributed under the project activity, identified by the type of device and date of commissioning; and 2) Identification information of the recipient of the device distributed under the project activity (e.g., name, address, phone number). Data management and reporting of this information must adhere to both data privacy requirements and good practice.
Frequency of monitoring/recording	Every time that new project devices are distributed
Value applied	119,938 ICS distributed in 59,969 households
Monitoring equipment	No equipment is used to monitor this parameter
QA/QC procedures to be applied	Transparent data analysis & reporting
Purpose of data	Calculation of baseline and project emissions

Calculation method	N/A
Comments	The number of project devices distributed will be recorded in a project stove registration database.

Data / Parameter	$n_{j,k,y}$
Data unit	Fraction
Description	Proportion of commissioned project devices of type j from batch k that are still being used regularly in year y
Source of data	Monitoring
Description of measurement methods and procedures to be applied	For monitoring period 01-April-2023 to 31-March-2025 PP has chosen the option 2 (Surveys) to get the proportion of project devices in operation. PP may use option 1: (SUMs) for future verification(s). **Option 1: (SUMs):** Measured directly using stove use monitors (SUMs) in a sample of users according to the most recent version of the CDM Standard for Sampling and Surveys for Project Activities and Programmes of Activities and achieving 90/10 confidence precision for the proportion of devices in operation. The SUMs must confirm that the stove is frequently used and functional. **Option 2 (surveys):** Based on an adoption rate determined by a survey according to the most recent version of the CDM Standard for Sampling and Surveys for Project Activities and Programmes of Activities and achieving 90/10 confidence precision for the proportion of devices in operation. The lower end of the 90% confidence interval must be used to ensure conservativeness. The adoption survey must include: a) Kitchen observation (which includes visual and physical checks of the stove and its components), including photographic evidence; and b) Interview with the primary cook. (The project proponent provides training and supervision as required to ensure field teams have the capacity required to complete adoption surveys successfully)
Frequency of monitoring/recording	Option 1: (SUMs): continuous Option 2 (surveys): annually
Value applied	0.594

	PP has considered the operational rate of 59.4%, as reported in the most recent MP MRV survey, compared to cap of 90% which is a conservative approach. This is as per Clarification 2 of VM0050, v1.0 "Correction and Clarification"
Monitoring equipment	N/A
QA/QC procedures to be applied	The date on which a sample project device stopped being used should be taken as follows: **Option 1: (SUMs):** The date on which the SUM ceased registering any activity of the project device. **Option 2 (surveys):** Where the project device is not working or not being used at the time of conducting the survey, it should be conservatively assumed that the project device has not been active since the date on which the last adoption survey was conducted.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	For both Options 1 and 2, where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per Section 4 of the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities.

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of woody biomass that is established to be non-renewable used by device in year y
Source of data	Tool 33: Default value for common parameters. Version 03.0
Description of measurement methods and procedures to be applied	Tool 33: Default value for common parameters. Version 03.0
Frequency of monitoring/recording	Ex-ante for each crediting period
Value applied	0.29
Monitoring equipment	N/A

QA/QC procedures to be applied	N/A
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	This parameter has been fixed ex-ante for the crediting period

Data / Parameter	$BC_{b,i,y}$
Data unit	tonnes
Description	Fuel used per baseline device type i during year y
Source of data	PP has chosen Option 1: Kitchen performance test as per the applied methodology (VM0050, v1.0)
Description of measurement methods and procedures to be applied	Follow-up baseline surveys must be conducted every five[31] years in control households that do not participate in the project. The PP has defined the baseline households (KPT survey) as control households ensuring the pre-project condition of project household regarding the baseline in the same geographic area/ cooking practice. The control HHs are primarily using traditional cookstoves and wood fuel. The same has been established prior to validation as statistically equivalent to the pre-project conditions of project households regarding baseline fuel consumption. The measurement campaign must be updated where follow-up baseline surveys show that the fuels, fuel sources, or technologies used by the control group are no longer statistically equivalent to the pre-project conditions of project households. The measurement campaign must be designed, carried out, and analyzed in compliance with the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities. The result must be scaled appropriately using the average household size to obtain the value of $BC_{b,i,y}$.
Frequency of monitoring/recording	Every five years
Value applied	2.6188 tonnes/HH/year In compliance with VM0050 v1.0 Corrections and Clarifications Clarification 1, baseline fuel consumption must be cross-checked

[31] CORRECTION AND CLARIFICATIONS TO VM0050 ENERGY EFFICIENCY AND FUELSWITCH MEASURES IN COOKSTOVES, V1.0

<table>
<tr><td></td><td>against credible, regionally relevant sources published within the past five years.

Below table has consolidated baseline fuel consumption per annum for various registered projects across Kenya:
<table><tr><td>Project ID</td><td>Baseline fuel consumption per annum (tonnes)</td><td>Remarks</td></tr><tr><td>VCS 4223[32]</td><td>3.30 tonnes/device/year</td><td>Baseline fuel consumption value derived from the project fuel consumption and savings.</td></tr><tr><td>VCS 1918[33]</td><td>3.47 tonnes/device/year</td><td>-</td></tr><tr><td>GS 12037[34]</td><td>3.53 tonnes/device/year</td><td>-</td></tr></table>
The baseline fuel consumption (2.6188 tonnes/HH/year) derived using baseline KPTs by the project is conservative compared to values used by other registered projects.</td></tr>
<tr><td>Monitoring equipment</td><td>Weighing scales & Digital Moisture Detectors</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>The campaign must achieve a confidence and precision of at least 90/10 for the target parameter of average daily fuel consumption per adult equivalent. Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per Section 4 of the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities[35].

Equipment is calibrated at appropriate intervals as per the manufacturer’s specifications.</td></tr>
<tr><td>Purpose of data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Calculation method</td><td>N/A</td></tr>
<tr><td>Comments</td><td>1) The KPTs were conducted by a competent team trained for performing KPTs based on the KPT protocol. The KPT questionnaire accounts for seasonal variation as per the KPT protocol.</td></tr>
</table>

[32] https://registry.verra.org/app/projectDetail/VCS/4223
[3333] https://registry.verra.org/app/projectDetail/VCS/1918
[34] https://registry.goldstandard.org/projects/details/3998
[35] https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210531160756223/Meth_Stan05.pdf

	2) Baseline follow-up surveys are conducted by the PP or third-party agencies appointed by PP.

Data / Parameter	$\eta_{new,avg,y}$
Data unit	Fraction
Description	Weighted average efficiency of project devices in year y
Source of data	Monitoring
Description of measurement methods and procedures to be applied	Manufacturer-certified value that is determined via Water Boiling Test The decrease in thermal efficiency of project device j from batch k due to aging accounted for during the monitoring period as presented below: For devices using biomass or fossil fuel, one of the following options must be selected, listed in descending order of preference: 8) Standard Water Boiling Test campaigns[36] 9) A linear decrease approach, applying a default schedule of linearly decreasing efficiency up to the terminal efficiency (assumed to be 25%) through the lifespan of the project device[37] PP Has chosen the sub option (b) above i.e., linear decrease approach to determine the project stove efficiency.
Frequency of monitoring/recording	Annually
Value applied	See table below

Year	$\eta_{new,avg,y}$ (Weighted average efficiency of project devices)
2020	0.3450
2021	0.3355
2022	0.3260
2023	0.3165
2024	0.3070
2025	0.2975
2026	0.2880
2027	0.2785
2028	0.2690
2029	0.2595
2030	0.2500

[36] Must be carried out following national standards (where available) or international standards or guidelines.
[37] Consider non-binding best practice example 6 in AMS-II.G.

Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$BC_{p,i,k,y}$
Data unit	tonnes
Description	Average quantity of fuel used by project device type j from batch k during year y
Source of data	Monitoring
Description of measurement methods and procedures to be applied	PP has chosen Option 1: Kitchen performance test (KPT) as per the applied methodology (VM0050, v1.0) A measurement campaign following the Kitchen Performance Test protocol must be designed, carried out, and analyzed in compliance with the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities. The campaign must achieve confidence and precision of at least 90/10 for the target parameter of average daily fuel consumption per adult equivalent. The result must be scaled appropriately using the average household size to obtain the value of $BC_{p,j,k,y}$. Project activities applying KPTs must also measure the quantity of fuel used by pre-project devices that are still operational and provide it in the calculation sheet and monitoring reports (this is a reporting-only requirement).
Frequency of monitoring/recording	Biennial
Value applied	2.2224 tonnes/HH/year
Monitoring equipment	Weigh scales and moisture meters
QA/QC procedures to be applied	As a crosscheck, compare results to government publications, peer-reviewed literature, third party assessments, and/or official data or statistics.

	Where SUMs are used to measure project stove adoption, the stove usage indicated by the measurements for this parameter must be consistent with the frequency of use indicated by SUM measurements. Equipment is calibrated at appropriate intervals as per the manufacturer's specifications.
Purpose of data	Calculation of baseline and project emissions
Calculation method	N/A
Comments	1) The KPTs were conducted by a team trained for performing KPTs based on the KPT protocol. The KPT questionnaire accounts for seasonal variation. 2) Where the project does not achieve the target precision in a monitoring period, the project proponent must apply an appropriate conservativeness deduction as per Section 4 of the most recent version of the CDM Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities[38]

5.3 Monitoring Plan

Monitoring Plan – Sampling Plan

The sampling plan, including design, data collected, and implementation plan are outlined below.

Sample Design:

Due to the large number of ICS distributed under the project, it is not economically feasible to monitor each individual household. Instead, a representative sample was selected for monitoring, in line with the requirements of the methodology. Samples were drawn from the project database, administered by the project proponent.

Objectives and reliability:

The objective is to obtain an unbiased and reliable estimate of the proportion or mean value of the following key variables over the course of the crediting period. As per applied methodology VM0050 a precision level of 90/10.

Monitored parameters:

[38] https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210531160756223/Meth_Stan05.pdf

Sr. No.	Monitoring parameter	Sampling parameter	Parameter type	Monitoring frequency
1	$N_{j,k,y}$	Number of commissioned project devices of type j from batch k in year y	-	Every time that new project devices are distributed
2	$n_{j,k,y}$	Proportion of commissioned project devices of type j from batch k that are still being used regularly in year y	Proportion value	Continuous or annually[39]
3	$BC_{b,i,y}$	Fuel used per baseline device type i during year y	Mean value	Every five years
4	$BC_{p,j,k,y}$	Average quantity of fuel used by project device type j from batch k during year y	Mean Value	biennial

Target population:

The target population are all households in the project database cooking with fuelwood in ICS distributed under the project.

Sample Size:

The procedure to determine the sample of households will ensure that they adequately represent the broader project population, minimizing sampling error. Using a 90 per cent confidence level, and a 10 per cent margin of error, a random sample will be selected from each strata.

Sample size refers to the number of observations or individuals included in a statistical study or experiment. Determining the appropriate sample size is critical to ensuring that the results of the study are accurate and representative of the population being studied.

- Mean values: Corresponding to average values inferred from data that are often referred to as continuous variables.
- Proportion (or percentage) values: Values that are derived from data that are described as attributes, yes/no data, or binary data.

As per Guideline for Sampling and surveys for CDM project activities and programmes of activities, version 04.0, there are different ways available to obtain the estimates of the parameter of interest:

a. Refer to the result of previous studies and use these results.
b. In a situation where information from previous studies is not available, a preliminary sample as a pilot could be conducted and use that sample is used to provide the estimates;
c. Use best guesses based on the researcher's own experiences.

Calculation approach for random sampling are as follows:

[39] Please refer parameter table for more detail

Sample size determination for mean parameter

$$n \geq \frac{1.645^2 N \times V}{(N-1) \times 0.1^2 + 1.645^2 \times V}$$

$$V = \left(\frac{SD}{mean}\right)^2$$

Where,

n	=	Sample size for households
N	=	Total number of households
SD	=	Expected standard deviation
mean	=	Expected mean, depends on similar studies or location
1.645	=	Represents the 90% confidence required
0.1	=	Represents the 10% relative precision

Sample size determination for proportion parameter

The equation for a 90/10 confidence/precision to give the required sample size is:

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.645^2 \times p(1-p)}$$

Where,

n	=	Sample size for households
N	=	Total number of households
p	=	Expected proportion of parameter of interest
1.645	=	Represents the 90% confidence required
0.1	=	Represents the 10% relative precision

The result, n, represents the number of households with data available for analysis. Where it is anticipated that a certain proportion of the sampled households will respond, adjust this number accordingly by dividing n by the anticipated proportion.

The expected proportion must not be more than one. A conservative range to apply could be between 0.5 to 0.7.

The equation for 95/10 confidence/precision to give the required sample size is:

$$n \geq \frac{1.96^2 N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.96^2 \times p(1-p)}$$

Where

n	=	Sample size for households
N	=	Total number of households

p	=	Expected proportion of operating cookstoves
1.645	=	Represents the 90% confidence required
0.1	=	Represents the 10% relative precision

The PP may choose to use the same sample to monitor more than one parameter. According to the Standard for sampling and surveys for CDM project activities and programme of activities, if there is more than one parameter to be estimated, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen as sampling effort with one common survey, or separate sampling efforts and surveys are undertaken for each parameter. For instance, the project proponent may sample separately $n_{j,k,y}$ and $BC_{p,j,k,y}$ –or a combination of these parameters in the same sample. Sampling more than one parameter within the same sample (household) helps reduce travel needs for monitoring and the associated costs. At the same time this approach ensures the random selection of samples for every parameter.

Oversampling is strongly encouraged, not only to compensate for any attrition, outliers or non-response associated with the sample, but also to prevent a situation at the analysis stage where the required reliability is not achieved and additional sampling efforts would be required. The sample size shown above will be adjusted upwards to account for non-responses, Project proponent shall determine the appropriate non-responses rate based on previous experience. If the required precision level is achieved during the survey the survey will be stopped for the strata.

Sampling Frame:

Overall, all ICS have the same group of end users, households. It is expected that end users can be assumed to be highly homogeneous for each ICS model. To formulate sample frame, all ICS operating will be combined together. The number of project devices operating may vary with ICS type, fuel used and project area where they are located & efficiency of the ICS depends on the ICS type and ICS age group. However, since efficiency for the stoves will be determined using default loss rate, the main sub-groups of ICS will be based on ICS type, fuel use and project area where they are located.

Sampling Approach:

The PP adopted a cluster random sampling approach to select the households. As the project population is spread over a large geographic area, simple random sampling could result in a widely distributed set of households that could require significant resources to monitor. The cluster random sampling approach selects a sample that is more logistically feasible to monitor while maintaining the same statistical representativeness of a simple random sample.

In our context, rural households within each county have similar socioeconomic and environmental characteristics, making them relatively homogeneous regarding fuelwood consumption patterns. As such, the cluster randomized approach provides a sample that is as statistically representative as simple random sampling. Further, oversampling ensures that the

final sample is representative. It supports that the primary selection criterion for installation is the need for ICS, indicating a shared need and context among the target households.

The PP used a cluster random sampling approach outlined below:

Spatial Clustering:

Using locality information (county, sub-county/district, commune, village), households were clustered. To ensure an operationally feasible minimum cluster size, clusters with fewer than 30 households are merged with their nearest neighbor until a minimum cluster size of at least 30 households is achieved.

Household Randomization:

All households in the project database are first sorted lexicographically. A cryptographically random value from the National Institute of Standards and Technology (NIST) Randomness Beacon is fetched to serve as a reproducible seed. The NIST Randomness Beacon generates and posts full entropy bitstrings once a minute.[40] These values are numbered, time-stamped and signed. As local random number generators can be manipulated, we rely on this approach to guarantee that randomization is objective. Further, as the NIST Randomness Beacon is recorded as described, the randomness used can be reproduced to ensure a transparent and auditable process. Using this seed, each household is shuffled and then numbered sequentially, resulting in a random ordering of all project households.

Cluster & Household Selection:

Using this random ordering of project households, we then select a set of clusters and within each selected cluster, we further select a subset of households for monitoring.

We assume that groups of ten households are logistically reasonable to conduct monitoring activities, including kitchen performance tests, household surveys, and installation of stove use monitors. A target number of clusters for each activity is set based on the sample size (more detail on sample size below). For Kenya, the targets were:

- KPTs: 100 households; 10 clusters
- MRV survey: 190 households; 19 clusters
- dMRV: 670 households; 67 clusters

Clusters are selected in order from the random ordering of all project households. If Household 1, per the random ordering, is in cluster C, then cluster C is a selected cluster. Then the cluster of Household 2 and so on is selected until enough unique clusters are identified for all MRV activities.

[40] In cryptography, unpredictability is measured in terms of entropy. Per NIST, a full entropy bit-string has an amount of entropy equal to its length and ideal randomness properties. The NIST assumes that a bitstring has full entropy if the amount of entropy per bit is at least $1-\varepsilon$ where ε is at most 2^{-32}. Additional discussion on this assumption is available at: https://nvlpubs.nist.gov/nistpubs/ir/2023/NIST.IR.8427.pdf.

From these clusters, households are selected. For each cluster, the first household in the random ordering of all project households is selected. Continuing sequentially down the random ordering list, only households in the same cluster as the first household and within one kilometer of households selected thus far are added. That is, the second household must be within one kilometer of the first household. The third household must be within one kilometer of the center point between the first and second household, and so on until 15 or 25 households are selected. For clusters used for KPTs, groups of 25 households are selected. For the remaining clusters, groups of 15 households are selected. If, using the first household, a group of 15 or 25 households meeting this criterion cannot be found, the first household is discarded and the second household is used as the initial household, and the selection is attempted again. It is re-attempted as many times as needed until 15 or 25 households are selected within the cluster for each randomly selected cluster.

From this clustering, the necessary number of clusters are selected for each monitoring activity. That is, 10 clusters are selected for KPTs, 19 for MRV survey, and 67 for dMRV following the same random ordering for potential monitoring.

This sample includes 15 or 25 households per cluster, of which 10 are actually monitored. The additional households account for cases such as households not being available or consenting to participate. Enumerators will visit as many households as required of the 15 or 25 to enroll 10 households and then stop.

Data to be collected:

Field measurement:

The table below summarizes field measurement data requirements:

Parameter	Frequency as per methodology	Methods to be applied	Comments on seasonal fluctuation
$n_{j,k,y}$	Continuous or annually	Visits to the premises, visual inspection and interview with ICS end-user	No effects of seasonal fluctuation
$BC_{p,j,k,y}$	Biennial	Visits to the premises, visual inspection, measurement of consumed quantity and interview with ICS end-user.	Surveys will be carried out in dry season to lead to conservative results

Data archiving:

All data is recorded on a mobile phone application in a digital survey system. The data collection includes a number of checks to ensure integrity. Information collected from the registration or other means of acceptance by the users will be stored on a server. All data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of credits for the project activity, whichever is later.

Quality assurance/Quality control:

The PP will apply measures to ensure the required confidence/precision for each sampled parameter is met, allowing for non-response and the possible removal of outliers from the sample, as part of a Quality Control/Quality Assurance system. The choice of measure applied to each parameter will depend on the cost of each data collection approach and logistics required. The project proponent will determine the most effective measure for each parameter from the following list:

- Oversampling: Randomly draw a sample more than the calculated number (say 20%) and collect data from each
- Buffer Group: Randomly draw additional samples (say 20%) and collect data from only for minimum numbers of ICS as per sample size calculation. If this does not result in the required sample size, additional data is collected from households that were selected in the sample.
- If precision required is not achieved by reliability check, use the lower bound or upper bound of estimates of the parameters.

The sampling plan has the following procedures in place to ensure good quality data. The PP has ensured that field personnel have reviewed, understand and have agreed to follow the monitoring plan procedures, including provisions for maximizing response rates, documenting out-of-population cases, refusals and other sources of non-response. A quality control and assurance strategy has been documented. Quality control and assurance strategies include addressing non-sampling errors, such as non-response or bias from interviewers. The project implementer or a competent third party designated by the project proponent with the proper skills will train the monitoring personnel on how to properly survey households to prevent bias from interviewers. When a household refuses to participate, another household will be chosen at random. To reduce interviewer bias, good questionnaire design and well-tested questionnaires will be used. Instruments used during monitoring surveys will be calibrated in accordance with their manufacturer's specification or as per standard industry procedures. Evidence of same shall be submitted to VVB at the time of verification.

The sample data for mean value parameter is continuous and therefore the presence of outliers is possible. In accordance with the BC SOP "Kitchen Performance Test Standard Operating Procedure, v1.1 dated 15 March 2025 all data points identified as outliers will be examined. The outliers are retained / removed based on their merit.

- Retain the outlier: The values are above outlier threshold, but they are business as usual scenario representing real world behaviors then they will be retained.
- Remove the outlier: If the values are outside the business usual scenario, for example gathering at home or fuel measurement values exceeding practical limits (e.g. 15 kg per capita per day).

Analysis:

The project proponent will manage a project database that includes the following data that can be directly attributable to each ICS within the project, thereby allowing unambiguous determination of the emission reductions attributable to each project:

- A list of households participating in each project, including name, location, distribution/installation date and unique serial numbers
- Where replacements are made, assurance that the efficiency of the new ICS is similar to the specified.

Data obtained from the samples will be used to estimate proportions and mean values for the parameters described above. The values will then be factored into the emissions reduction calculations and result in the request for issuance of VCUs. The parameters are applied for emission reduction calculations. The stoves that are not in use will be excluded from emissions reductions calculations and will not be counted towards the total number of ICS in operation during the monitoring period.

Implementation:

Sampling for the purpose of emission reduction calculation and elaboration of the monitoring report will occur at the end of each monitoring period. This sampling will be conducted by trained personnel from project proponent.

The credentials and/or training materials for the sampling personnel will be provided to the VVB at verification. The maximum length of one monitoring period will be two years (duration, not calendar years), with the option of annual or biannual monitoring. The project implementer will be responsible for managing household data collection and entry into the project database. Field personnel will receive training on surveying techniques and reducing errors as well as sign a document certifying that there is no conflict of interest of those involved in data collection and analysis. If there is conflict of interest, the personnel will not be allowed to participate in data collection and analysis. The project database will record the start and end dates of each monitoring period and record the emission reductions attributable to each monitoring period

Appropriate record-keeping procedures will be implemented to ensure that each monitoring period data set can be transparently attributed to its corresponding project, preventing any occurrences of double counting. An internal review of the project database will be able to determine the current status of each project— the duration of previous monitoring periods, the households delivering monitoring data, and current verification activities.

Avoidance of Double Counting:

The PP has signed a contract with the ICS manufacturer that they will not claim any GHG emission reduction for the ICS manufactured and distributed.

The PP has signed an end user agreement with the household taking the benefit of ICS that they are the owner of the ICS but they will not claim any emission reduction and Bridge Carbon will be sole entity claiming the GHG reductions.

Project Database:

The project database will be derived from the Installation Record. All data collected in relation to the project will be held in the central office / Data management System of the PP and maintained for the entire life cycle of the project and an additional two years thereafter. The end users of the cookstoves are identified and included in the cookstove user list for the duration of the project and updated when required.

Data and Information for Carbon Operations (DISCO): The data collection process is supported by a modular system architecture designed to ensure data integrity, operational flexibility, and strong access control. Key components include FOPS (Field Operations), MOPS (Mobile Operations), CPIM (Carbon Portfolio and Inventory Management), and UMAP (User Management, Access & Permissions), each playing a specific roll in the data lifecycle.

This multilayered approach ensures only complete and logically sound data are approved in the system.
The system follows industry-standard data protection practices:

- Encryption: All data is encrypted in transit and at rest.
- Access control: Role-based access minimizes data exposure.
- Device security: MOPS supports device-level encryption and corporate enrolled devices enable secure data wipe features.
- Compliance:
  - The platform is designed toward supporting applicable data privacy frameworks.
  - The platform's geographically distributed backend supports compliance with data sovereignty requirements with the capability to domicile physical storage of protected information such as names, phone numbers, and address information within specific countries where required by law.

Managing data in proprietary software ('DISCO'), which provides end-to-end data management and reduces errors, miscalculations from incorrect data entry.

Ongoing Monitoring Studies:

The following ongoing monitoring studies are conducted for each project scenario following verification of the associated initial project studies.

- Monitoring usage with KPTs and dMRV
- Continuous dMRV sampling up to 2% of households for each project (far greater than 90/10 CI). The stoves are randomly chosen for monitoring by the dMRV provider as described above; data is end-to-end encrypted and only accessible by the third party dMRV provider.
- MRV field data is collected with digital tablets using a platform designed and maintained by the dMRV provider.

- Partnering with Berkeley Air Monitoring Group to train staff on KPT data collection and encode best practices in a new Standard Operating Procedure
- Partnering with Geocene (third-party) for usage monitoring using dMRV devices.

The PP will be adopting the new VM0050 methodology, Digital Monitoring, Reporting, and Verification Tool recognized as the most rigorous in the industry, and we are implementing stringent systems, processes, and training internally.

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

There is not any commercial sensitive information that has been excluded from the public version of the PDD.

Section	Information	Justification
NA	NA	NA

APPENDIX 2: PROJECT DESCRIPTION DEVIATION

PP has sought the project description deviation due to the inactivation of applied methodology "VMR0006 Energy Efficiency and Fuel Switch Measures in Thermal Applications[41]" which has replaced by "VM0050 Energy Efficiency and Fuel-switch measures in Cookstoves, Version 1.0[42]" on 09-October-2024.

The details of deviation due to the inactivation of methodology are as follows:

1. PP confirms that project has following data to apply the new methodology as per Procedure to Change Methodology through a Project Description Deviation, v 4.0 dated 16-October-2024. The sources provided in section 5.1 and 5.2 of VCS PD for respective data parameters tables.
    a. Baseline Survey (KPTs)
    b. Usage Rate details
    c. Fraction of woody biomass that is established to be non-renewable used by device in year y
    d. Fuel used per baseline device type i during year.
    e. Weighted average efficiency of project devices in year y.
    f. Average quantity of fuel used by project device type j from batch k during year y.

2. Applicability Conditions of methodology has been updated as per VM0050, Version 01 in section 3.2 "Applicability of Methodology" of this PD.

[41] https://verra.org/methodologies/vmr0006-methodology-for-installation-of-high-efficiency-firewood-cookstoves/
[42] https://verra.org/wp-content/uploads/2024/10/VM0050-EE-and-Fuel-Switch-Measures-in-Cookstoves-v1.0.pdf

3. GHG Emission reduction calculation has been updated as per "VM0050, Version 01" in section 4 "Quantification of Estimated GHG Emission Reductions and Removals" of this PD.
4. Data and parameters available at the time of validation has been updated as per "VM0050 (Version 01)" in section 5.1 "Data and Parameters Available at Validation" of this PD.
5. PP has applied Ex-ante f_{NRB} value in line with updated VM0050 methodology source 3 "Default value of the most recent version of CDM TOOL 33".
6. Data and parameters monitored has been updated as per "VM0050 (Version 01)" in section 5.2 "Data and Parameters Monitored" of this PD.
7. Correction in monitoring plan has been made in section 5.3 "Monitoring Plan" of this PD.
8. There is a correction for name change from C-Quest Capital SGS Stoves Private Limited to Bridge Carbon Africa Stoves Development Private Limited and project ownership rights transferred to Bridge Carbon Africa Stoves Development Private Limited.
9. The PP may include other ICS model(s) in the project with similar or better efficiency. Details of the stoves will be included during the respective monitoring period and supporting documents will be provided during verification.
10. PP has updated the TLC Rocket stove diagram for better clarity about the stove parts in section 1.12 "Description of the Project Activity" of this PD.

There is no impact on additionality of the project activity. PP has demonstrated the additionality of the project activity as per VM0050 Version 01, Step 1: Regulatory surplus and Step 2: Positive list. Thus, there is no impact on additionality of the project activity by the project description deviation.

These deviations do not affect design of the project activity and the nature of this deviation is permanent.