INSTALLATION OF HIGH EFFICIENT COOK STOVES BY EKI ENERGY SERVICES LIMITED

EKI Energy Services Limited

Project Title	Installation of High Efficient Cook Stoves by EKI Energy Services Limited
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1 PROJECT DETAILS

1.1 Summary Description of the Project

The main purpose of project is distribution of fuel-efficient improved cook stoves (ICS) in Indian state of Assam. The ICS disseminated through this project has replaced old low efficient baseline cook-stoves.

Through this project, the distribution and installation of high thermal efficient improved cook stoves (ICS) has been undertaken across 35,045 households. The ICS burns wood more efficiently thereby improving thermal energy transfer to pots, hence saving fuel wood and greenhouse gases. Not only will this halt the rapidly progressing deforestation but will also reduce health hazards from indoor air (smoke) pollution and women and children will have to spend less time in collecting firewood.

As the target populations are unable to afford these stoves (ICS), project promoters have distributed ICS free of cost. The end user has been informed in advance that the use of ICS generates carbon finance which in turn is used to cover the price of ICS and for recovering project implementation costs.

The project locations for all Project Activity Instances is in Assam state of India and details are provided in Section 1.12 of this document. The project location details, KML files is provided in VCS MR.

The ICS will substitute the currently common cooking on open fire. The baseline scenario is the continued use of non-renewable biomass (fire wood) by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity. Under current grouped project activity, 35,045 project activity instances (ICS) have been implemented till the date of submission of validation report. the first Instance was implemented on 15-February-2020. The project activity is likely to result in annual emission reduction of 211,856 tCO_{2e} per annum and 1,482,989 tCO_{2e} for the entire crediting period.

1.2 Sectoral Scope and Project Type

The sectoral scope and type of project applicable are as below

Sectoral scope: 03 - Energy demand

Type: II – Energy efficiency improvement projects

The project is a grouped project

1.3 Project Eligibility

The project involves energy efficient cookstove distribution which falls under the category of efficiency improvements in thermal applications, therefore it is eligible under the scope of VCS

Program. As per VCS Standard Version 4.1, efficiency improvements in thermal applications (e.g., cook stoves) are not excluded, hence project is eligible under VCS.

1.4 Project Design

The project is a grouped project

Eligibility Criteria

For the inclusion of new project activity instances:

No.	Criterion	How the new project activity instances to comply	Compliance of the project activity instances with the eligibility criteria
1	Meet the applicability conditions set out in the methodology applied to the project	New project activity instances (Energy Efficient Cook Stoves) will meet the applicability conditions set out in Section 3.2 where the target of the end-user is household and the ICS deployed is at least 25% of thermal efficiency.	The improved cookstoves considered under the instances are distributed to households only The efficiency of the distributed cookstoves is 32.19% which is higher than 25%
2	Use the technologies or measures specified in the project description.	The technology used for project activity is energy efficient cook stoves. Only energy efficient cook stoves to be adopted in the project by replacing traditional cook stoves in household.	The improved cookstoves distributed under the project activity are improved cookstoves with thermal efficiency of 32.19%.
3	Apply the technologies or measures in the same manner as specified in the project description.	Only energy efficient cook stoves to be adopted in the project by replacing traditional cook stoves in household.	Use of the improved cookstoves distributed to beneficiaries are energy efficient cookstoves and the use of same has replaced the use of fuel inefficient traditional cookstoves
4	Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	The new project activity instances will be installed within India subject to the same baseline scenario determined in Section 3.4.	The project activity instance is implemented in the state of Assam which is within the geographical boundary of India

No.	Criterion	How the new project activity instances to comply	Compliance of the project activity instances with the eligibility criteria
5	Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.	All new project activity instances will use the activity method for demonstration of additionality. Step 1: Regulatory Surplus There is no mandated government programme or policy in host country of this project ensuring the distribution of new energy efficient cook stoves for each project activity instances. Step 2: Positive List The inclusion of new project activity instances will comply with positive list as it satisfies criterion 1 where it meets all the applicability conditions of the methodology.	Since the cookstoves distributed to the beneficiary are at free of cost and there has been no other source of revenue other than the sale of GHG credits the project activity instance is considered under positive list and is deemed additional.
6	Where a capacity limit applies to a project activity included in the project, no project activity instance shall exceed such limit. Further, no single cluster of project activity instances shall exceed the capacity limit, determined as follows: Each project activity instance	No project activity instance shall exceed the applicable limit, which is 180 GWhth/y.. Since the project activity instances have same model, thus thermal efficiency, survey details are same. Annual energy saving per ICS is 0.0160 GWhth/y which is 0.02% of the threshold limit. Based on threshold limit of methodology i.e having total	The energy savings of the instance is 0.0160 GWhth/y which is 0.02% of the threshold limit and therefore complies t

No.	Criterion	How the new project activity instances to comply	Compliance of the project activity instances with the eligibility criteria
	that exceeds one percent of the capacity limit shall be identified. Such instances shall be divided into clusters, whereby each cluster is comprised of any system of instances such that each instance is within one kilometer of at least one other instance in the cluster. Instances that are not within one kilometer of any other instance shall not be assigned to clusters. None of the clusters shall exceed the capacity limit and no further project activity instances shall be added to the project that would cause any of the clusters to exceed the capacity limit.	thermal energy saving less than 180 GWhth/y, the ICS quantity per project activity instance are considered. As the annual energy saving is below 1% of the limit, therefore no project activity instance is identified and divided into clusters. .	

1.5 Project Proponent

Organization name	EKI Energy Services Limited
Contact person	Manish Dabkara
Title	Managing Director & Chief Executive Officer
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91 99075 34900
Email	manish@enkingint.org and registry@enkingint.org

1.6 Other Entities Involved in the Project

At the present, EKI Energy Services Limited is the sole entity involved in the project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Ramkrishna Patil, Director- Operations
Title	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Address	+91 9096562065
Telephone	EKI Energy Services Limited
Email	ramkrishna.patil@enkingint.org and registry@enkingint.org

1.7 Ownership

The project ownership is with EKI Energy Services Limited.
The ICS are distributed to end uses (Households) at free of cost. The end users are informed in advance that the use of ICS generates carbon finance which in turn is used to cover the price of ICS and for recovering project implementation costs. The participating household has signed a declaration to transfer the ownership rights of the carbon assets generated from this project to the EKI Energy Services Ltd, also undertaking is provided by EKI for projects ownership. The undertaking from manufacturer and distributor and end user agreement has been submitted to confirm that cook stove ownership is with EKI Energy Services Limited.

1.8 Project Start Date

15-February-2020 (The earliest date of commissioning of a batch distributed for the project activity instances)

1.9 Project Crediting Period

First crediting period: 15- February-2020 to 14- February-2027, seven years renewable crediting period. Being renewable crediting period, total crediting period of grouped project activity is 21 years

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

☐ <20,000 tCO_2e/year

☐ 20,000 – 100,000 tCO_2e/year

☒ 100,001 – 1,000,000 tCO_2e/year

☐ >1,000,000 tCO_2e/year

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1	221,622
Year 2	218,312
Year 3	215,035
Year 4	211,791
Year 5	208,579
Year 6	205,399
Year 7	202,251
Total estimated ERs	1,482,989
Total number of crediting years	7
Average annual ERs	211,856

The above ER estimation is with consideration all project activity instances and total 35,045 cook stoves and with 365 days of operation per year with 0% annual loss or non- operation of ICS

assumption. Based on survey result, annual loss or non-operation of ICS will be considered for actual ER calculations. The average lifetime of cook stove is 7 years, but it may expect that cook stove will be in operation beyond 7 years also. Thus, above ER estimation is determined considering the 7 years of operation.

1.11 Description of the Project Activity

The project involves distribution of fuel-efficient improved cook stoves (ICS) to replace the baseline traditional cook stoves in households.

The ICS deployed under this project is energy efficient which substantially reduces fuel consumption and emissions for conducting cooking and water heating tasks in homes. The ICS improve the efficiency of combustion and thermal transfer to the pot compared with a traditional pot support or three-stone fire by incorporating energy efficient technology which provides a conducive environment for clean and efficient combustion of wood. It substantially reduces wood fuel consumption compared with a less efficient or three-stone fire or traditional pot support.

The project activity cook stoves are with different manufacturers and specifications of cook stoves will be provided during validation/verification or during inclusion of project activity instances.

Technical Specifications of Cook Stoves for all project activity instance from Manufacturer Swami Samarth Electronics Pvt. Ltd:

TECHNICAL DETAILS			
A)	Cook Stove Type/Category	AGNEEKAA ECO MINI STOVE MODEL4	
		Natural Draft	
B)	Secondary Air Supply	Through Natural Draft	
C)	Stove Material Used	Body	Galvanized Iron Sheet
		Body Material Thickness	0.6mm
		Combustion Chamber	Stainless Steel SS 202 grade
		Combustion Chamber Material Thickness	1 mm SS 202 grade
		Insulating Material	Thermal Wool
		Insulating Material Thickness	6 to 8mm
		Top Plate	Stainless Steel SS 202 grade
		Top Plate Material Thickness	1 mm
D)	Physical Structure	External Dimension	Length :- 260mm
			Width :- 260mm
			Height :- 248mm
		Combustion Chamber Dimension	Diameter :- 125mm
E)	Grate Thickness	2 mm Material HR sheet	

TECHNICAL DETAILS			
F)	Wight Of the Stove	3.8 Kg	
G)	Type of Fuel Wood	Firewood 30 to 50 mm diameter	
H)	Feeding Process	Continuous Feeding Front Loading	
I)	Expected life of stove	7 Years	
J)	Guarantee /Warranty Period	1 Years	
K)	Box Dimension	Outer Side Box Dimension	Length :- 300mm
			Width :- 300mm
			Height :- 270mm
L)	Thermal Efficiency	32.19%	

The manufacturer may change for future project activity instances and same will be transparently reflected during verification. The details and specifications of respective cook stoves will be considered for ER calculation of project activity instance.

Type of ICS used is based on below thermal efficiency: Tier 2 Thermal Efficiency (%) ≥ 25%, Tier 3 Thermal Efficiency ≥ 35% and Tier 4 Thermal Efficiency ≥ 45%

Data collection of ICS end-user

Project proponent must gather the necessary information to identify households using its ICS during the course of the project. To facilitate this process, each ICS will be assigned a unique serial number. This number will be 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/ Village name of ICS household
- Stove model Distributed
- Date of distribution/installation
- ICS serial number
- Retailer/distributer/Manufacturer information

The information collected will be stored in the electronic database excel sheet which will serve as project database for project monitoring and sampling purposes. The traditional cook stoves were operational and this was the scenario prior to the implementation of project.

1.12 Project Location

All the project activity instances in the proposed grouped project activity are located within geographical boundaries of Indian states of Assam in Udalguri district.

For project activity instances, geographical area is in Assam. Thus, the KML file is submitted for Udalguri district of Assam in India.

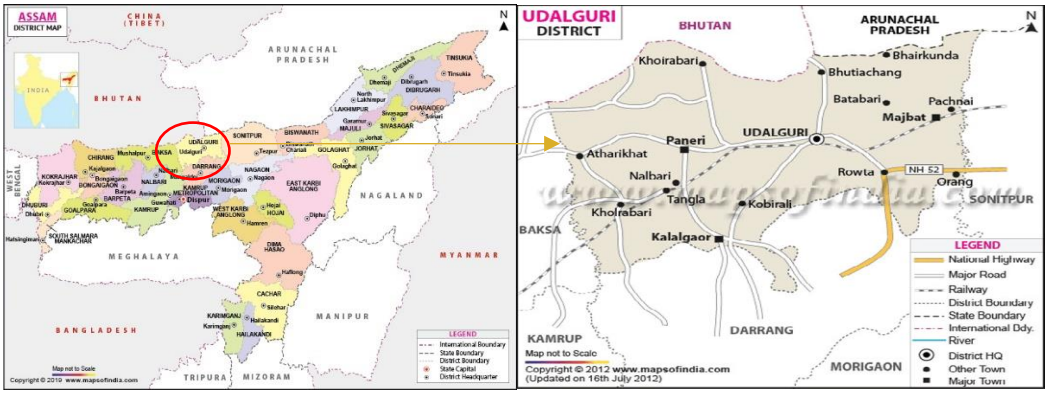
The geographical boundary for projects located in Udalguri district of Assam and is delineated in the form of extreme geographic coordinates of Udalguri district of Assam as follows:

Latitude – 26°46′ North

Longitude – 92°08′ East

Please refer below web link for the range of co-ordinates

https://udalguri.assam.gov.in/resource/detail/district-profile



1.13 Conditions Prior to Project Initiation

The purpose of the project is to reduce the demand for non-renewable biomass for household cooking needs. An estimated 50%[1] to 60% of households in rural India still cook using traditional biomass stoves and open fires. The project aims to reduce the environmental and social burdens caused by inefficient biomass cooking by introducing energy efficient wood and charcoal stoves to low- income households. The baseline scenario is the same as the conditions existing prior to the project initiation i,e continue the use of traditional cook stoves.

- **Has the land been cleared of native ecosystems within 10 years of the project start date?**

☐ Yes ☒ No

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

There are no laws and regulations governing the use of improved cookstoves in India for households. The project is a voluntary effort by the project proponent.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has not been registered, nor is it seeking registration under any other GHG program

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG program

1.16 Other Forms of Credit

[1] https://www.business-standard.com/article/pti-stories/how-to-make-rural-india-switch-to-cleaner-cookstoves-119052100422_1.html

1.16.1 Emissions Trading Programs and Other Binding Limits

The project is not included in an emissions trading program or any other mechanism that includes GHG allowance trading. The undertaking is submitted for same.

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

1.16.2 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit. The undertaking is submitted for same.

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes ☒ No

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

Project activities contribution to Sustainable Development

The project activity includes distribution of fuel efficient improved cookstoves amongst beneficiaries in the rural areas of Assam in India, using traditional cookstoves in the pre-project scenario for cooking, thereby replacing use of inefficient cookstoves. Implementation of the project activity resulting in reduction of firewood consumption (through facilitation of fuel-efficient combustion) and improving indoor air environment (by reducing emission smoke and soot resulting from inefficient firewood consumption) will contribute to the sustainable development priorities by conserving forest/biodiversity and reduction of health burden.

Sustainable Development Contribution

The project contributes to social, environmental, economic and technological benefits which contribute to sustainable development of the country are as follows:

Social benefits

1. Reduces drudgery to women (due to reduced fuel wood use) who spend long hours and travel long distances to collect fuel wood.
2. Improves overall health of women and children by reducing smoke in the kitchen, thus reducing health hazards from indoor air pollution.

3. Better cooking time – the materials used in making the ICS transmit the heat effectively, cooking the food faster.
4. Better cooking environment due to less smoke and carbon residue in the kitchen.
5. Better quality of life – the rural communities get family time as the whole family can sit and eat together.

Environmental benefits

1. Improves the local environment by reducing rate of degradation of forests and deforestation in the project area.
2. Reduce indoor pollution – ICS emits less smoke and reduces morbidity from respiratory diseases and other health hazards, as well as the medical expenditure involved. A resource-poor household would need to spend limited available finances on medicines, further exacerbated by loss of wages from both not being able to work and having to look after the ill-person.
3. Reduce global and local environmental pollution and environmental degradation by reduction in use of non-renewable biomass thus leading to reduction in GHG emissions.
4. Less water and effort is needed for cleaning vessels as the cooking process is relatively smoke free.

Economic benefits

1. Employment opportunities for local communities through the CDM activity.
2. Reduces purchase of fuel wood and/or wage equivalent from reduced firewood collection time.

Technological benefits:

- Introduction of efficient technology to the rural communities

Project contributes to achieving nationally stated Sustainable Development Priorities

Considering the diverse socio-economic and cultural perspectives, sustainable development priorities for India has been set out at subnational level in line with the global SDG vision of 2030 and in conformity with local needs and priorities. Govt of Assam (location of the project activity) has set out the vision document for attaining the sustainable development goals including setting of priorities as against each of the SDG goals[2]. One of the priorities set out in the vision document includes reduction of death due to ill effect of hazardous pollutant. The project activity through reduction of the indoor air pollution (emission of carbon monoxide, soot, etc) will reduce the incidence of morbidity and mortality due to diseases triggered by indoor air pollution.

[2] https://transdev.assam.gov.in/sites/default/files/portlet/level_2%5Bcurrent-domainmachine-name%5D/ASSAM_2030_Our_Dream__Our_Commitment.PDF

Although no direct indictor has been set out for monitoring achievement against said target, NITI Aayog (Govt of India) as part of the subnational SDG indexing, monitors "monthly per capita out of pocket expenditure on health as a share of Monthly Per Capita Consumption Expenditure" which closely resembles to the identified SDG contribution by the project activity as reduction of indoor air pollution is likely to reduce the incidence of health issues amongst women and children (subjected to indoor air pollution) and thereby reduce the expenditure on health. The performance status of the said indicator as published by Niti Ayog will be used to assess the impact on SDG.

1.17.2 Sustainable Development Contributions Activity Monitoring

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
Sequential row number	*SDG Target number*	*Number and text of SDG indicator or, if no official SDG indicator is applicable, user-defined indicator*	*Indicate the project's contribution to the SDG Indicator (implemented activities to increase or decrease)*	*Brief description of the quantifiable impact of the project's activities related to the SDG indicator, during the monitoring period.*	*Brief description of the cumulative quantifiable impact of the project's activities related to the SDG indicator, over the project lifetime.*
1)	7.1.	7.1.2. Proportion of population with primary reliance on clean fuels and technology	Implemented activity to increase the proportion of population with primary reliance on clean technology (fuel efficient ICS)	Distribution of 35,045 number of ICS thereby replacing the use of baseline inefficient cookstoves has resulted in increase in population with reliance on clean technology	The project has resulted in increased reliance on clean technology through distribution of 35,045 numbers of improved cookstoves.
2)	3.9	3.9.1 Mortality rate attributed to household and ambient air pollution	Use of ICS will decrease household air pollution	Distribution of ICS will reduce household air pollution in 35,045 households and thereby mortality rate attributed to household air pollution.	Lowered indoor air pollution in 35,045 households by facilitating use of improved cookstoves.

3)	13.2	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to result in decrease of greenhouse gas emissions	Through distribution of 35,045 number of ICS thereby replacing the use of baseline inefficient cookstoves the project has prevented release of 404,947 tonnes of carbon-dioxide in the atmosphere during the monitoring period.	Prevented the release of 404,947 tonnes of carbon-dioxide into the atmosphere

1.18 Additional Information Relevant to the Project

Leakage Management

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

Commercially Sensitive Information

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

Further Information

Not applicable

2 SAFEGUARDS

2.1 No Net Harm

The project will only bring positive impacts on environmental and socio-economic aspects as elaborated in Section 1.17. No potential negative environmental or socio-economic impacts have been identified for the project, thus this section is not applicable.

2.2 Local Stakeholder Consultation

Summary of the stakeholder's consultation meeting

Local stakeholders' meetings were conducted to take public comments. Three stakeholder meetings were conducted the details of which are –

Date of the Meeting	Location	District	State
13/01/2020	3 No Uttar Dimakuchi	Udalguri	Assam
13/01/2020	2 No Hattigon	Udalguri	Assam
13/01/2020	Tangla Ward no 2	Udalguri	Assam

The overall response from the local stakeholders on the project was encouraging and positive. No adverse or negative comments or response received in the meeting. The participants of the meeting had not raised any significant concerns nor seek any clarification related to potential impacts of the project activity or any other issue. The project as a whole gives positive impression towards the issue of sustainable development of the country. Copy of public notice, minutes of meeting and attendance register submitted for verification.

Modalities of stakeholder's engagement

Villagers at each of the three locations are being informed about the consultation meeting one month in advance through public notice at key places/ points of public gathering and also by informing key members of Gaon Panchayats (GPs) including Sarpanch about the purpose and agenda of the project and stakeholders' consultation meeting for dissemination of information regarding the consultation meeting. Concerned institutional stakeholders were also invited through invitation letter submitted directly at the office/institutions of the stakeholder's concerned.

Public input during local stakeholder consultation.

Beneficiaries from diversified work profile including housewife's attained the stakeholder's consultation meeting at three locations including both men and women.

Date of the Meeting	Location	Male	Female	Total	Profile
13/01/2020	3 No Uttar Dimakuchi	7	19	26	Farmers, Housewife
13/01/2020	2 No Hattigon	25	5	30	Farmers, Housewife
13/01/2020	Tangla Ward no 2	21	9	30	Business personnel, Housewife, Worker

The stakeholder's attending the consultation meeting are being provided with feedback form for providing inputs and suggestions regarding the project activity in addition to the grievance register being maintained at the meeting site for submission of input/ grievance if any related to the project activity. The physical query by stakeholder's (during question-and-answer session) were noted and, the query along with the response provided by the project proponent are minuted by the representative of the project proponent. The copy of the minutes of meeting is provided to the DOE.

In addition, the contact details of the project proponent and local representative/ partner of the project proponent were also provided to the stakeholder's attending the consultation meeting for sharing suggestions/ queries either through call/messaging/ e-mailing post meeting.

Consideration of input

No negative input has been received during the consultation. The inputs and concerns were positive in nature and therefore no requirement of updates to the project design is required.

Mechanism for ongoing communication

As a part of on-going communication, beneficiaries were informed about grievance register, and provided with the details of the point of contact and contact information including that of the project proponent and its local authorised representatives. The grievance register is maintained by the distributors (authorised representatives of the project proponent) of the cookstoves, and the distributors focal point for a particular geography is assigned with the responsibility for recording the grievance and convey the same to the project proponent so as to address the stakeholder's concern.

In addition, each of the cookstoves users were provided with the contact details of distributor's local authorised representatives (local) and project proponent during handover of the improved cookstoves and were also explained about the grievance submission/recording process and its redressal mechanism.

As a part of the grievance submission mechanism the beneficiary can either visit the distributor facility for submission of grievance or can inform the distributor representative over call. In case the beneficiary is not satisfied with the distributor, beneficiary can reach out to project proponent for intimation of the same. The beneficiary might also record the grievance (in grievance register) during periodic visit of the distributor representative for maintenance purpose.
Thus, ongoing communication of stakeholders is followed through grievance mechanism. If any concerns received during operation of project activity, same will be addressed if relevant to project activity.

Grievance Redressal

For comments/grievance that is being received during the consultation meeting, project proponent and the distributor will adopt appropriate measures for its resolution during the meeting.
On receipt of intimation of grievance/complaint from the beneficiary after the stakeholder's consultation meeting, the distributor will convey the same to project proponent. Based on the nature of complaint, the distributor will act immediately for resolution of the issues in consultation with the project proponent.

2.3 Environmental Impact

No negative environmental impacts have been identified from the project and environmental impact assessment (EIA) is not required for the project. In fact project activity supports positive environmental impacts.

2.4 Public Comments

There are no comments received during 30 days public comment period.

2.5 AFOLU-Specific Safeguards

This section is not applicable as the project is a non-AFOLU project

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

VCS Methodology: VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1.1 dated 22 July 2021, Sectoral scope 3

https://verra.org/wp-content/uploads/2021/07/VMR0006-Methodology-for-Installation-of-High-Efficiency-Firewood-Cookstoves-v1.1.pdf

This methodology also refers the latest version of AMS II.G version 12 - Energy efficiency measures in thermal applications of non-renewable biomass

https://cdm.unfccc.int/methodologies/DB/10PELMPDW951SVSW1B2NRCQEBAX96C

For calculation of fraction of non-renewable biomass, the below tool is used "TOOL30: Calculation of the fraction of non-renewable biomass"- Version 04.0

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v3.0.pdf

3.2 Applicability of Methodology

The applicability of methodology is justified as below

Applicability criterion	How the project complies
Project activities shall be implemented in domestic premises or in community-based kitchen	The proposed project involves deployment of ICS only in households.. For all project activity instance, project activity is implemented in households.
The project stove shall have specified high- power thermal efficiency of at least 25% per the manufacturer's specifications and shall exclusively use woody biomass and can be single pot or multi-pot;	Energy Efficient stoves is installed under this project are single pot portable cook stoves that have an efficiency more than 25%. For all project activity instance, ICS with efficiency of 32.19% is installed as per the manufacturer's specifications.
Both 'Projects' and 'Large Projects' can use the methodology	Each project activity instance will be Projects
Non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics;	Non-renewable biomass has been used since 31 December 1989 in India as demonstrated below by referring to published literature, official reports or statistics;

For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips), it shall be demonstrated that: a. It is produced using exclusively renewable biomass (more than one type of biomass may be used) b. The consumption of the fuel should be monitored during the crediting period c. Energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting)	Not applicable as project activity does not use prcessed biomass as a fuel. The ICS is introduced as energy efficiency measure to replace baseline stoves and reduce the use of non-renewable biomass for combustion.
The VCS PD shall explain the proposed method for distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations (e.g. programme logo) The above criteria is as per below VCS meth requirement and para 7 of latest version of meth AMS II.G version 12 is followed. (Additionally, applicability criteria numbers 8 and 9 set out in Section 2.2 of AMS II.G, version 11.1 shall apply)	Each ICS have unique serial number, thus unique identification of product and end user is followed. The distributor has identified village representative to distribute the cook stove, make the installation data for baseline scenario and project activity details. The Project Owner have provided the undertaking that no double counting of emission reductions occurred due to unique identifications of product and end-user location.
The VCS PD shall also explain how the proposed procedures prevent double counting of emission reductions, for example to avoid that project stove manufacturers, wholesale providers or others claim credit for emission reductions from the project devices.	Manufacturers/ cook stove distributors undertaking is provided that there is no any double accounting for carbon emissions associated with ICS supplied to households under the project activity having Project Owner (EKI Energy Services Ltd.) . EKI will be owner of that carbon credits and Manufacturers/ cook stove distributors will not claim any credits for such cook stoves.

The above criteria is as per below VCS meth requirement and para 8 of latest version of meth AMS II.G version 12 is followed. (Additionally, applicability criteria numbers 8 and 9 set out in Section 2.2 of AMS II.G, version 11.1 shall apply)	

Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.

Justification: Use of non-renewable biomass is established through demonstration of gap between the demand of fire wood and silviculturally permissible production of biomass from forest and tree outside forest. The fact is established using published literature referring to the following studies:

Food and Agricultural Organization of United Nation[3] Regional Wood Energy Development Programme in Asia

The literature highlights gap in demand and supply of fuel wood across the country. In accordance to the study, fuel wood consumption in real terms is much higher than the recorded production of about 30%; thus, leaving a wide gap leading towards unsustainable extraction of fire wood. Moreover, on account of population pressure, demand for firewood has outstripped natural regeneration and planting, so much so that in some areas there is food to eat but not enough wood is available to cook it (Mathur, 1987)". The report also highlights the statistics from Forest Survey of India (FSI1988:46) which estimated a gap of 130 million tonne between the demand and internal production of firewood in the country in 1987.

State of Forest Report 1987[4], MoEFCC, Govt. of India

The report highlights gap between the demand and production of fire wood as major cause of deforestation. The reported consumption and production across the country within silviculturally permissible limit across the following years is indicated as follows –

Year	Consumption in million tonnes	Recorded Production in million tonnes
1953-54	86.3	6.49
1960-61	99.6	8.15
1965-66	109.3	9.16
1970-71	117.9	11.62
1975-76	133.1	19m. from forest and 30 m. from tree outside forest

[3] Regional Wood Energy Development Programme In Asia GCP/RAS/154/NET, RWEDP Report No 57, The Wood Fuel Scenario and Policy issues in India. Published by the FAO Regional Wood Energy Development Programme in Asia, Bangkok, Thailand

[4] https://fsi.nic.in/documents/sfr_1987_hindi.pdf (refer page 44 of document, section 3.4 of Chapter III Demand On Forests"

In accordance the gap between demand and production is met through pilferage leading to continuous depletion of forest land.

Wood Fuel Trade in India: Food and Agricultural Organisation of United Nation:

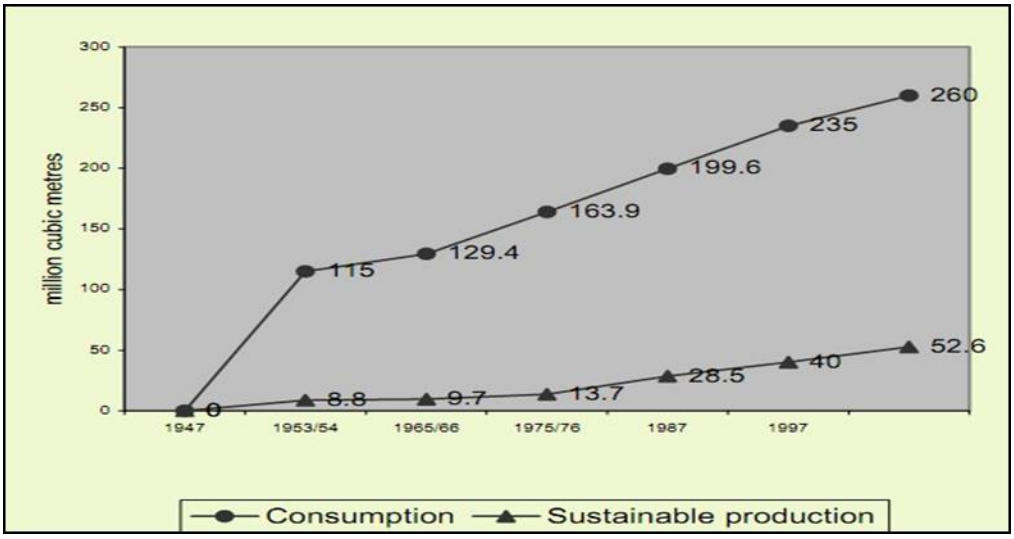
The report outlines demand- supply gap which has referred the expert committee report of MoEF dated 30.01.1998 as below –

			In million cubic meter
Year	**Consumption**	**Sustainable Production**	**Gap**
1953-54	115.0	8.8	106.2
1965-66	163.9	13.7	150.2
1975-76	199.6	28.5	171.4
1987-88	235.0	40.0	195.0

Rural Energy data sources and estimations in India – TERI[5]

The report refers to gap between consumption and recorded production of fuel-wood has however, increasing, indicating seriousness of the fuel-wood scarcity in India.

Fuel wood consumption and sustainable production since 1947



Also, as per Forest Survey report 2011 (This is latest survey report for India where demand and supply is determined. Due to COVID-19 pandemic, no survey done for year 2021), (https://fsi.nic.in/cover_2011/chapter7.pdf) has been considered for production of fuelwood from forests 1.232 Million Tonnes (table 7.4.2) and availability of fuel wood from trees outside forest is 19.254 million tonnes (table 7.4.3) annual fuel wood consumption is 216.421 million tonnes (table 7.4.7). This indicates that demand is more than sustainable production/availability of wood, thus in present scenario, the non- renewable biomass is used in the project region

[5] https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.581.9840&rep=rep1&type=pdf

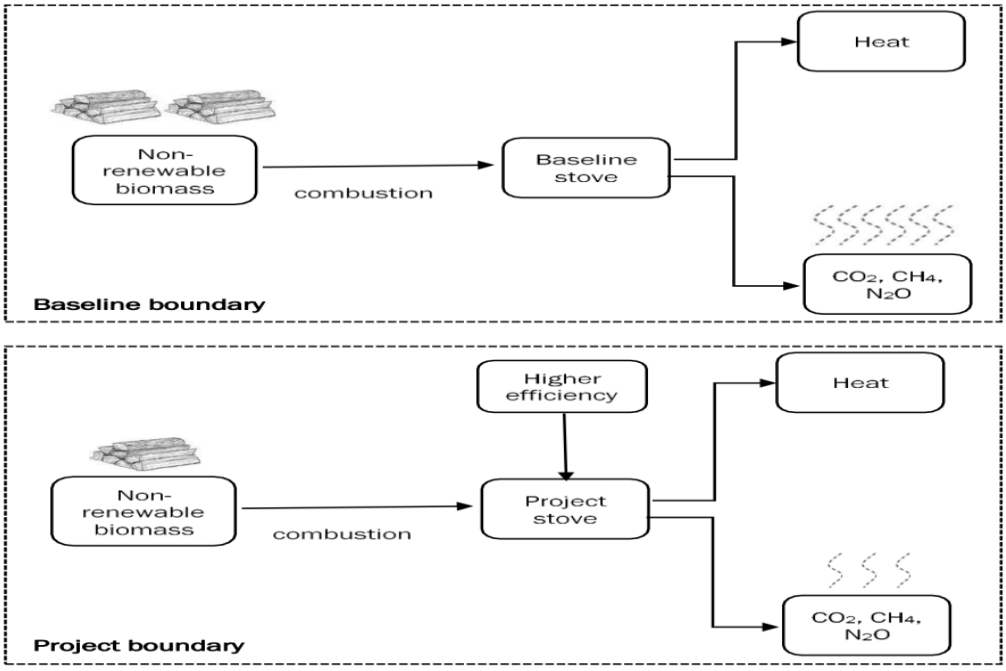
Conclusion:

Therefore, it is established from the above studies that, a staggering gap exists between the demand and potential for sustainably extractable fuel wood from forest land. While the first three studies refer to the fuel wood supply scenario and the gap that were precedent before 1989; the study by TERI highlight the widening of gap between the demand and supply of biomass after 1989. The widening of the gap has been both due to the increased population pressure as well as the conversion of dense forest to medium dense, scrub and open type forest land due to unsustainable extraction even after the government's initiative towards promotion of afforestation. Thus, it can therefore be concluded that the gap exists from and before 1989 and continued thereafter, forcing the population in using biomass extracted in un- sustainable manner which is identified as non-renewable component

3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Emission from use of non-renewable biomass/Fossil fuel	CO_2	Yes	Major source
		CH_4	Yes	Major source
		N_2O	Yes	Major source
		Other	No	No other source identified
Project	Emission from use of non-renewable biomass	CO_2	Yes	Major source
		CH_4	Yes	Major source
		N_2O	Yes	Major source
		Other	No	No other source identified

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



3.4 Baseline Scenario

As per methodology "The baseline scenario is the continued use of non-renewable wood fuel (firewood/charcoal) or fossil fuel (coal/kerosene) by the target population to meet similar thermal energy needs as provided by project cook stoves in absence of project activity."

The project activity instances to be included in this grouped project activity should meet the baseline scenario as mentioned above.

Baseline Scenario

The improved cookstoves under the project activity are distributed to selected households (at free of cost) who are only relying on traditional cookstoves without any improved combustion air supply or flue gas ventilation, and without a grate or a chimney and using biomass as a fuel for cooking. Households using fuel other than biomass or using improved cookstoves/ cook stoves with chimney, flue gas ventilation system and grate are not selected under the project activity in accordance to beneficiary selection criteria. The information pertaining to existing cookstoves used and fuel usage as intimated by the beneficiary are also physically verified during the cookstove (ICS) handover process. The handover of improved cookstoves are facilitate only upon physical inspection of the existing cookstoves and signing of end user agreement. Since all the beneficiary selected under the project activity complies to the baseline requirement of use of non-renewable wood fuel (firewood) in traditional cookstoves to meet the thermal energy requirement therefore for all project activity instance, the baseline scenario 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

3.5 Additionality

The methodology uses activity method for the demonstration of additionality.

Activity Method

Step 1: Regulatory Surplus

There is no mandated government programme or policy in host country of this project ensuring the distribution of domestic fuel-efficient cookstoves. The project is not mandated by any law, statute or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute or other regulatory framework.

Households may only participate voluntarily in this project. It is hereby confirmed that the proposed project is a voluntary coordinated action by EKI.

Step 2: Positive List

As per Section 3.2, the project meets the applicability conditions of the methodology which represent the positive list.

The project installs the ICS at zero cost to the household and has no other source of revenue other than the sale of GHG credits.

The project is not implemented as part of government schemes or supported by multilateral funds.

Conclusion: As the project fulfills the conditions above, it is deemed additional.

If any project activity instance does not follow the positive list as stipulated by methodology, then additionality need to demonstrate as per tool requirement.

3.6 Methodology Deviations

The project did not apply any methodology deviations

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The methodology does not account for baseline emissions separately, but instead quantifies net emission reductions achieved by the project. Please refer to Section 4.4.

4.2 Project Emissions

The methodology does not account for baseline emissions separately, but instead quantifies net emission reductions achieved by the project. Please refer to Section 4.4

4.3 Leakage

Leakage shall be considered as default 0.95 in accordance with methodology

4.4 Estimated Net GHG Emission Reductions and Removals

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

$$ER_y = \sum_i \sum_j ER_{y,i,j}$$

Where:

i = Indices for the situation where more than one type/model of improved cookstove is introduced to replace three-stone fire. Same model will be used in each instance

j = Indices for the situation where there is more than one batch of improved cookstove of type i.Single batch stove will be used in each instance
ERy = Emission reductions during year y in t CO2e
ERy,i,j = Emission reductions by improved cookstove of type i and batch j during year y in t CO2e

$$ER_{y,i,j} = B_{y,savings,i,j} \times NCV_{wood\ fuel} \times f_{NRB,y} \times \left(EF_{wf,CO2} + EF_{wf,non\ CO2}\right) \times N_{y,i,j} \times 0.95$$

Where:

$B_{y,savings,i,j}$ = Quantity of woody biomass that is saved in tonnes per improved cookstove of type i and batch j during year y
$fNRB,y$ = Fraction of woody biomass that can be established as non-renewable biomass (fNRB)
$NCVwood\ fuel$ = Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne)6
$EFwf,CO2$ = CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO2/TJ)7
$EFwf,non\ CO2$ = Non-CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO2/TJ)8
Ny,i,j = Number of improved cookstoves of type i and batch j operating during year y
0.95 = Discount factor to account for leakage

The quantify of woody biomass saved due to implementation of improved cookstoves to be estimated using equation below (Equation 4 of methodology)

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

Where

η_{old} = Efficiency of baseline cookstove
$\eta_{new,y,i,j}$ = Efficiency of the improved cookstove type i and batch j determined through water boiling test (WBT) during year y

Alternatively, efficiency may be determined using below Equation

$B_{y=1,new,i,j,survey}$ = Annual quantity of woody biomass used by improved cookstoves in tonnes per device of type i and batch j, determined in the first year of the implementation of the project through a sample survey.

$$\eta_{new,i,y} = \eta_p \times (DF_n)^{y-1} \times 0.94$$

Where

η_p = Efficiency of project stove (fraction) at the start of project activity.

$(DF_n)^{y-1}$ = Discount factor to account for efficiency loss of project cookstove per year of operation (fraction). This value may be based on actual monitoring or based on manufacturer's declaration on expected loss in efficiency or through publicly available literature on relevant industry standards. Alternatively default value of 0.99 efficiency loss per year can be considered.
0.94 = Adjustment factor to account for uncertainty related to project cookstove efficiency test.

For ex-ante calculation purpose, the assumption below is applied :

For ex-ante calculation purpose, the assumption below is applied for first project activity instance.

1) The first project activity instance installs 35,045 numbers of ICS.
2) The life span of ICS is 7 years; thus the operational lifetime of each project activity instance is taken as 7 years. It will extend 10 years or beyond 7 years after proper repair and maintenance. The end users can repair the ICS through the service providers (PP representative) who will repair the cook stove for further use. After 7 years of lifetime, a report from Maintenance Company will be provided to confirm the extended life of cook stove. The project will claim credits beyond 7 years only for balanced year till cook stove is replaced by new cook stoves.
3) Annual stove loss rate is estimated at 0%. This is assumed for estimation. During actual ER calculation, this value is varies. This value will vary during actual verification based on survey results. During current monitoring period, there is no any non operational cook stove
4) 6) By=1, new,i, survey, is assumed as 1.7885 tonnes / device / year. This is considered as 4.9 Kg of biomass is required per device and 365 days of operations. This is based on survey results

Determination of number of ICS of type i and batch j operating during year y

Number of ICS of type i and batch j operating during year y is estimated as below

$N_{y,i,j}$ = 35,045 x [1 - (y-1) x Annual stove loss rate%]

Where

y – year of operation

Annual stove loss rate - To be obtained based on survey

Example of calculation:

If y = 2,

Proportion of ICS in use

$N_{y,i,j,,}$ = 35,045 x [1 - (2-1) x 0%]

= 35,045

Hence, the number of ICS operating during year y is as below:

Year (y)	Ny,i,j
1	35,045
2	35,045
3	35,045
4	35,045
5	35,045
6	35,045
7	35,045

Determination of efficiency of ICS during year y

$\eta_{new,,,}$ = $\eta p \times (DFn)^{y-1} \times 0.94$

Where

Efficiency of project stove (fraction) at the start of project activity	ηp	32.19%
Discount factor to account for efficiency loss of project cookstove per year of operation (fraction) based on methodological default value of efficiency loss per year		0.99
Adjustment factor to account for uncertainty related to project cookstove efficiency test		0.94
Year	y	

=

Example of calculation:
If y= 2
$\eta_{new,,,}$ = 32.19% X (0.99)$^{(2-1)}$ X 0.94
= 29.96%

Hence the efficiency of ICS during year y is as below:

Year (y)	Adjustment factor	(DFn)	$\boldsymbol{\eta new,y,i,j}$
1	0.94	0.99	30.26%
2	0.94	0.99	29.96%
3	0.94	0.99	29.66%
4	0.94	0.99	29.36%
5	0.94	0.99	29.07%
6	0.94	0.99	28.78%
7	0.94	0.99	28.49%

Determination of quantity of woody biomass that is saved in tonnes per ICS during year y

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

Example of calculation: If y= 2,
$B_{y,\text{savings,i,j}}$= 1.7885X [(0.2996/0.1) -1]
= 3.57 tonnes

Year (y)	$\boldsymbol{B_{y=1,new,i,survey}}$	$\boldsymbol{\eta new,y,i,j}$	$\boldsymbol{\eta old}$	$\boldsymbol{B_{y,savings,i,j}}$
1	1.7885	30.26%	0.1	3.62
2	1.7885	29.96%	0.1	3.57
3	1.7885	29.66%	0.1	3.52
4	1.7885	29.36%	0.1	3.46
5	1.7885	29.07%	0.1	3.41
6	1.7885	28.78%	0.1	3.36
7	1.7885	28.49%	0.1	3.31

Note - The lifespan of cook stove is 7 years, however with proper repair and maintenance, the lifespan can be extended beyond 7 years, and hence ER estimation is determined for 7 years. After 7 years of lifetime, a report from Maintenance Company will be provided to confirm the extended life of cook stove. The project will claim credits beyond 7 years only for balanced year till cook stove is replaced by new cook stoves.

Determination of emission reductions by ICS of batch 1 during year y

$ER_{y,i,j} = B_{y,savings,i,j} \times NCV_{wood\ fuel} \times f_{NRB,y} \times (EF_{wf,CO2} + EF_{wf,non\ CO2}) \times N_{y,i,j} \times 0.95$
Where
$NCV_{wood\ fuel}$ = 0.0156 TJ/tonne
$f_{NRB,}$ = 0.8520. As per calculation of methodological tool, the fraction is determined and same is considered for ER estimation. The calculations are done as per tool.
$EF_{wf,2} + EF_{wf,non\ CO2}$ = 112 + 26.23 = 138.23 tCO_2/TJ

Example of calculation:

If y=2,
$ER_{y,,}$ = 3.57 X 0.0156 X 0.852 x 138.23 X 35,045 X 0.95
= 218,312 tCO2e

Thus 7 years estimation for Project Activity Instance 1 is as below

ER estimation is done for Project Activity Instance 1 (9,986 ICS quantity)

Year	$By,savings,i,j$	$NCVwood\ fuel$	$fNRB,y$	$EFwf,CO2+EFwf,non\ CO2$	Ny,i,j	ERy,i,j
1	3.62	0.0156	0.852	138.23	35,045	221,622
2	3.57	0.0156	0.852	138.23	35,045	218,312
3	3.52	0.0156	0.852	138.23	35,045	215,035
4	3.46	0.0156	0.852	138.23	35,045	211,791
5	3.41	0.0156	0.852	138.23	35,045	208,579
6	3.36	0.0156	0.852	138.23	35,045	205,399
7	3.31	0.0156	0.852	138.23	35,045	202,251
					Total	**14,82,989**
					Annual Average	**211,856**

The total ER estimation combined for all 4 Project activity Instances are as below

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
1	221,622	0	0	221,622
2	218,312	0	0	218,312
3	215,035	0	0	215,035
4	211,791	0	0	211,791
5	208,579	0	0	208,579
6	205,399	0	0	205,399
7	202,251	0	0	202,251
Total	**1,482,989**	0	0	**1,482,989**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$f_{NRB,Y}$
Data unit	Fraction

Description	Fraction of woody biomass saved by the project activity during year y that can be established as non-renewable biomass
Source of data	Use a default value of 0.3 as per Tool 30 - Calculation of the fraction of non-renewable biomass. Or Calculate f_{NRB} by determining the share of renewable and non-renewable woody biomass in the total quantity of woody biomass consumption for the country/region
Value applied:	0.852 (calculated as per Meth tool)
Justification of choice of data or description of measurement methods and procedures applied	This parameter shall be determined ex-ante. Default value as per Methodological tool: Calculation of the fraction of non-renewable biomass. As per of methodological tool, value is calculated as per following Equation (1), f_{NRBy} = NRB/(NRB+DRB)
Purpose of Data	Calculation of baseline emission
Comments	https://fsi.nic.in/cover_2011/assam.pdf State of Forest report (Forest Survey of India Ministry of Environment, Forest & Climate Change, GoI, 2019)

Data / Parameter	$NCV_{wood\ fuel}$
Data unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted or reduced
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	IPCC default value
Purpose of Data	Calculation of baseline emission
Comments	-

Data / Parameter	$EF_{wf,CO2}$
Data unit	tCO2/TJ
Description	CO2 emission factor for the use of wood fuel in baseline 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	IPCC default value
Purpose of Data	Calculation of emission reductions
Comments	-

Data / Parameter	$EF_{wf,nonCO2}$
Data unit	tCO2/TJ
Description	Non-CO2 emission factor for the use of wood fuel in baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion
Value applied	26.23
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value
Purpose of Data	Calculation of emission reductions
Comments	-

Data / Parameter	η_{old}
Data unit	Fraction
Description	Efficiency of baseline cookstove
Source of data	Methodological default value
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	A default value of 0.1 shall be used if baseline device is a three-stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney. During baseline survey, it is observed that baseline device was a three- stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney, hence default value of 0.1 is considered for Efficiency of baseline cook stove.
Purpose of Data	Calculation of emission reductions
Comments	

Data / Parameter	η_p
Data unit	Percentage
Description	Efficiency of project stove at the start of project activity.
Source of data	Manufacturer's specification
Value applied	32.19%
Justification of choice of data or description of measurement methods and procedures applied	This parameter shall be determined ex-ante
Purpose of Data	Calculation of $\eta\mathbf{new},y,\mathbf{i},\mathbf{j}$

Comments	This efficiency is for the cook stove model considered for initial project activity instances. If manufacturer or cook stove model changes, the respective model efficiency will be considered for ER calculations

Data / Parameter	$(DF_n)^{y-1}$
Data unit	Fraction
Description	Discount factor to account for efficiency loss of project cookstove per year of operation (fraction).
Source of data	As per methodology, default value of 0.99 efficiency loss per year
Value applied	0.99
Justification of choice of data or description of measurement methods and procedures applied	This parameter shall be determined ex-ante
Purpose of Data	Calculation of $\eta\mathbf{new},y,\mathbf{i},\mathbf{j}$
Comments	-

Data / Parameter	$\eta_{new,y,i,j}$
Data unit	Fraction
Description	Efficiency of the improved cook stove type i and batch j determined as per equation 5 of methodology during year y
Source of data	Calculation
Value applied	For ex-ante calculation, the value below is applied

Year (y)	$\eta_{new,y,i,j}$
1	30.26%
2	29.96%
3	29.66%
4	29.36%
5	29.07%
6	28.78%
7	28.49%

Justification of choice of data or description of measurement methods and procedures applied	This parameter shall be determined ex-ante. The average lifetime of cook stove is 7 years, but it may expect that cook stove will be in operation beyond 7 years also with proper repair and maintenance of cook stoves. This should be checked during survey. After 7 years of lifetime, a report from Maintenance Company will be provided to confirm the extended life of cook stove. The project will claim credits beyond 7 years only for balanced year till cook stove is replaced by new cook stoves.
Purpose of Data	Used for calculation of quantify of woody biomass saved
Comments	Calculation to be performed using equation below: $\eta new,y,i,j = \eta p \times (DFn)y-1 \times 0.94$

	Monitoring frequency is at the start of project activity instance (The project opts to determine the efficiency using the equation 5 given by methodology, therefore it is not required to monitor this parameter via Sampling survey.) However the grouped project activity provides the option to use of different model of cook stove for new future project activity instances to be included, hence this parameter value may vary based on different model of future instances. Default value of 0.99 efficiency loss per year can be considered In case of ICS model changes for new project activity instances, the efficiency of new ICS model should be determined during verification and same will be considered for that project activity instance..

5.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
Data unit	Number
Description	Number of project devices of type I and batch j operating during year y
Source of data	Monitoring
Description of measurement methods and procedures applied	Measured directly or based on a representative sample. As per methodology, minimum sample size determine in which case compliance with 90/10 confidence precision is not obligatory. 100 Sample size is selected being target population is above 1000
Frequency of monitoring/recording	At least once every two years
Value applied:	For ex-ante emission reduction calculation, it is assumed that the project will distribute up to 35,045 ICS for four project activity instance and the installation/ distribution of ICS to be implemented in batches.
Monitoring equipment	Sample survey
QA/QC procedures applied	-
Purpose of data	Calculation of emission reductions
Calculation method	Proportion of operational stoves obtained from the survey is multiplied by the total commissioned stoves to arrive at this value
Comments	PP has distributed one ICS per housholds and same is followed for each project activity instances.

Data / Parameter	$B_{y=1,new,i,j,survey}$
Data unit	Tonnes
Description	Annual quantity of woody biomass used by improved cook stoves in tonnes per device of type i and batch j, determined in the first year of the implementation of the project through a sample survey
Source of data	Monitoring survey
Description of measurement methods and procedures to be applied	Minimum sample size of each type i and batch j should be in line with the latest version of Standard for sampling and surveys for CDM project activities and programme of activities or guidelines provided in methodology Section 8.4 option (b). Determined in the first year of the introduction of the devices (e.g. during the first year of the crediting period, y=1) through measurement campaigns at representative households and/or sample survey. Sample surveys to estimate this parameter, that are solely based on questionnaires or interviews (i.e. that do not implement measurement campaigns) may only be used if the following conditions are satisfied. (i) Baseline cookstoves have been completely decommissioned and only improved cookstoves are exclusively used in the project households; (ii) If multiple devices are used in the project, it is possible from the results of the survey questions to clearly differentiate the quantity of firewood being used by each device. In other words, if more than one device, or another device that consumes firewood, are in use in project households, then the sample survey needs to distinguish the quantity of firewood used by the project device and the other devices that use firewood.
Frequency of monitoring/recording	Determined in the first year of project implementation
Value applied	For ex-ante calculation, the value is assumed as 4.9 kg/device/day or equal to 1.7885 tonnes/device/year. This value is based on survey results.
Monitoring equipment	Monitoring survey
QA/QC procedures to be applied	--
Purpose of data	Calculation of emission reductions
Calculation method	--
Comments	--

Data / Parameter	Date of commissioning of batch *j*
Data unit	Date
Description	To establish the date of commissioning, the Project Participant has opted the latest date of commissioning of a device within the

	batch shall be used as the date of commissioning for the entire batch.
Source of data	Project database
Description of measurement methods and procedures to be applied	--
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution of the last project device in the batch
Value applied	15/02/2020 (first date of batch of ICS commissioned in the project activity instance) The start date of crediting period is considered from 15/02/2020 onwards
Monitoring equipment	--
QA/QC procedures to be applied	--
Purpose of data	Calculation of emission reductions
Calculation method	--.
Comments	--

Data / Parameter	Life Span
Data unit	*Years*
Description	Operating lifetime of project device for projects opting Equation 5 for determining project stove efficiency
Source of data	Manufacturer declaration
Description of measurement methods and procedures to be applied	*NA*
Frequency of monitoring/recording	Once at the time of Project stove installation
Value applied	*7 years*
Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Calculation of $\eta\mathbf{new},y,\mathbf{i},\mathbf{j}$
Calculation method	*NA*
Comments	*NA*

5.3 Monitoring Plan

Monitoring Approach

In accordance to applied Methodology (Methodology for Installation of High Efficiency Firewood Cookstoves Version 1.1) measurement/monitoring of few parameters is based on a representative sample survey. In accordance to methodology, Sampling standard are to be used for determining the sample size to achieve 90/10 confidence precision according to the latest version of Standard for sampling and surveys for CDM project activities and programme of activities. Alternately, simplified approach proposed in option (b) under Section 8.4 of methodology may be used for determining the minimum sample size in which case compliance with 90/10 confidence precision is not obligatory.

In accordance to option (b) under Section 8.4 methodology , the project participant may alternatively follow the simple random sampling approach and the minimum sample size should be determined as per the guidelines:

- Project target population < 300: Minimum sample size 30
- Project target population 300 – 1000: Minimum sample size 10% of group size
- Project target population > 1000: Minimum sample size 100

This simplified approach may also be used for determining minimum sample size for parameters listed under Sections 9.1 and 9.2 of the methodology in which case it is not requisite for the sample size to meet confidence/precision requirements.

Since the target population is above 1000, the sample size of 100 is selected in line with the aforesaid r guidelines of methodology-

Monitored Parameters

The project involves implementation of improved cook stove as energy efficiency measures:

No.	Monitoring Parameters	Monitoring Approach	Sampling parameters	Parameter type	Monitoring frequency
1	Ny,i,j Number of project devices of type i and batch j operating during year y	Physical interview of sample population using structured questionnaire and visual inspection of improved cookstoves	Proportion of ICS still in operation.	Proportion	Biennially (once in two year)

No.	Monitoring Parameters	Monitoring Approach	Sampling parameters	Parameter type	Monitoring frequency
2	$By=1,new,i,j,survey$ Quantity of woody biomass used by project devices in tonnes per device of type i. and batch j	Physical interview of sample population using structured questionnaire	Daily consumption of woody biomass per ICS	Mean value	Determined in the first year of project implementation
3	Use of Baseline stoves along with project stoves during the monitoring period	Physical interview of sample population using structured questionnaire and visual inspection of use of traditional cookstoves if any	Proportion of users using traditional cookstoves along with project cookstoves	Proportion	Biennially (once in two year)
4	Date of commissioning of batch j or Project activity instance	Review of agreement with beneficiary	Date of commissioning in a batch or project activity instance.	The latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch	During each project activity instance.
5.	Date of commissioning of project device	Review of agreement with beneficiary	Actual date of commissioning of the project device (each ICS)	Actual date	During each project activity instance.

Sampling Approach

Target Population

The target population will be the complete set of appliances (ICS) deployed under the project.

Sampling Method

The project involves distribution of ICS throughout the project area thereby replacing traditional cooking devices. The population is homogeneous in nature i.e. common technology with similar

operating characteristics and dispersed in same state (Assam) in India. Since the characteristics of population (for example quantity of biomass consumed) are more similar within the stratum (ICS of same type, vintage and zone in which they are operating), simple random sampling technique is used to conduct sampling survey among ICS batches.

The populations of each instances is combined together, the sample size is determined, and a single survey per instance is undertaken to collect data. To ensure the survey result is representative of the entire population, the dissimilarity (such as ICS type, vintage and zone in which they are operating) within the included project activity instance will be taken into account in the sample size calculation. The ICS of same type, vintage and zone in which they are operating will be grouped in the same strata. Samples will be drawn by using the random number generator.

To determine the parameters, sampling will involve the following approaches (outcome in brackets):

$N_{y,i,j}$ Visual inspection of the premises to see if ICS is operational and in use.

Interview with end user if required to verify that ICS is still in use (Yes/No)

Baseline cookstoves usage – Interview of end users to ensure whether beneficiaries are using traditional cookstoves along with project cookstoves (ICS)

$B_{y=1,new,i,j,survey}$ Interview with end user and estimate the daily consumption of woody biomass of ICS (Daily consumption of woody biomass)

Sample Size:

This simplified approach may also be used for determining minimum sample size for parameters listed under Sections 9.1 and 9.2 of the methodology in which case it is not requisite for the sample size to meet confidence/precision requirements.

The project proponent may choose to use the same sample to monitor more than one parameter. According to the Standard for sampling and surveys for VCS 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 $N_{y,i,j}$ and $B_{y=1,new,i,j,survey}$ –or a combination of two 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.

Sampling Frame

Separate samples shall be taken for each project activity instance. The sampling frames shall be defined as per below. In overall, a batch of ICS will have same group of end users which is household users, thus it is expected that the geographical locations do not have influence on the parameter of interest. Therefore, all monitoring parameters can be assumed to be highly homogeneous for each ICS model regardless of how the end user group and distribution/installation location is defined.

To formulate sample frame, all ICS operating under the project activity instance will be combined together. The number of project devices operating may vary with ICS type and zone where they are located & efficiency of the ICS depends on the ICS type and ICS age group. Therefore, ICS can be sub- grouped into strata based on ICS batch, ICS type, ICS age group and zone where they are located.

Data to be collected as part of Sampling:

Field Measurement:

The table below summarizes field measurement data requirements:

Parameter	Timing (indicative)	Frequency as required by methodology	Methods to be applied	Comments on seasonal fluctuation
$N_{y,i,j}$	Monitoring will likely occur every 12 to 24 months	Biennially	Visits to the premises, visual inspection and interview with ICS end-user.	Not due to any seasonal fluctuation.
$B_{y=1,new,i,j,survey}$	Monitoring will likely occur within the first year after installation	First year of installation	Visits to the premises, visual inspection and interview with ICS end-user.	Not due to any seasonal fluctuation.

Soft copies of the surveys will be kept and the database will have back up. Original stove purchase contracts, information collected from the registration or other means of acceptance by the users will be stored in the project office. A back-up of the project database will also be stored on an electric medium. 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 project proponent 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 would not result in the required sample size data would be collected from the additional ICS 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 parameter.
-

The sampling plan has the following procedures in place to ensure good quality data. The project proponent will ensure 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 will be documented. Quality control and assurance strategies include addressing non-sampling errors, such as non-response or bias from interviewer. The project proponent 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 interviewer. In the case 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.

The sample data for mean value parameter is continuous and therefore the presence of outliers is possible. To identify and address outliers for the parameter, outliers will be defined as those data points with values greater than three standard deviations from the mean of the sample. Data points identified as outliers will be examined further to correct for possible transcription and data entry errors but will be omitted from the analysis if no such administrative errors exist.

Data Review and Tabulation

1. At the first step data related to users/beneficiary information and result of survey will be reviewed /triangulated and thereafter tabulated in database/excel spreadsheet by the team members of distributor / operational Team (Local Representative) member from the user agreement and survey schedule respectively.

At the next step the database/excel spreadsheet containing beneficiary/ survey information will be cross verified by EKIESL team member with hard copy of end user agreement and survey schedule to ensure correctness of data transfer.

Analysis

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

- A list of households participating in each batch / project, including name, community/location, distribution/installation date and unique serial number;
- Testing to ensure that the stoves are still operating above the minimum 25% efficiency required by the methodology, by the project proponent or a third party certified by a national standards body or an appropriate certifying agency recognized by it.
- 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 VERs. 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.

Internal Audit

Project Participant has constituted the team for internal audit as a part of quality control and quality assurance mechanism towards ensuring data completeness (including triangulation and verification of monitored data/parameters and correctness of data transfer from user agreement and structured interview schedule to database/excel) in conformance with monitoring and reporting guidelines as well as maintenance of data to avoid any risk of error in estimation of emission reduction. This purpose of internal audit includes

1. Cross verification of the information obtained as part of sample survey to identify outliers /erroneous data if any
2. Random review of data transfer between beneficiary database and end user agreement
3. Random review of data transfer between survey schedule/ structured questionnaire and monitoring excel spreadsheet (used for emission reduction estimation)
4. Cross check of improved cookstoves usage through calling of beneficiaries in addition to periodic survey
5. Internal audit of emission reduction estimation
6. Internal audit of the record of training undertaken

This internal audit to be conducted at an interval of six months will identify discrepancies/ nonconformities if any and if identified, will be included in the audit findings and appropriate measures are undertaken immediately. Report on internal audits done, discrepancies/ nonconformities identified and corrective action taken is maintained and kept for external auditing (verification)

The internal audit will also identify scope for potential improvements to procedures to improve monitoring and reporting. If such improvements are proposed these will be reported to the DOE.

Implementation

The project participant may follow the simple random sampling approach and the minimum sample size should be determined as per the following guidelines:

- Project target population < 300: Minimum sample size 30
- Project target population 300 – 1000: Minimum sample size 10% of group size
- Project target population > 1000: Minimum sample size 100

The simplified approach are used for determining minimum sample size of 100 for parameters available at validation and parameter to be monitored in which case it is not requisite for the sample compliance with 90/10 confidence precision is not obligatory.

These parameters are as below

Number of project devices of type i and batch j operating during year y

Quantity of woody biomass used by project devices in tonnes per device of type i.

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 personal from project proponent or an experienced third-party entity. The credentials and/or training materials for the sampling personal will be provided to the VVB at verification. The maximum length of one monitoring period will be two years (duration, not calendar years), with option for annual or bi-annual monitoring. The project proponent will be responsible for managing household data collection and entry into the project database. Field personnel will receive training on how to properly deal with surveying techniques and reduce errors and 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 batch/project, preventing any occurrences of double counting. An internal review of the project database will be able to determine the current status of each batch — the duration of previous monitoring periods, the households delivering monitoring data, and current verification activities.

(i) Assessment for Leakage

The methodology provides a net to gross adjustment factor of 0.95 to account for leakages, hence the surveys are not required to determine leakage.

The other source of leakage occurs if equipment currently being utilised is transferred from outside the boundary to the project activity. All ICS in the project are newly manufactured/assembled or newly installed, thus no leakage is applicable.

(ii) Disposal of Low Efficiency Appliances and Use of Baseline Stoves

When an ICS is installed, the end user receives information explaining that conventional open fire appliance must no longer be used. Follow-up meetings with end users will ensure that those who have received an ICS are using it properly and that the conventional open fire is no longer in use. If it is determined that the conventional open fire is still in use along with the operating ICS, a survey will be conducted, and discount will be applied to ER formulae for emission reduction adjustment.

(iii) Monitoring Reporting

The project proponent will assess all monitoring data and produce a monitoring report for the VVB to verify corresponding to the preceding monitoring period. This report will present the data relating to the emission reductions generated by those project activity instances during the monitoring period.

The purpose of the monitoring plan is to ensure successful monitoring of the emission reductions of the proposed project during its crediting period. The overall monitoring will be managed by the project implementer EKI Energy Services Ltd.(EKIESL)

Activities and performance related to emissions reduction are monitored by EKIESL. The PP proposed the following roles and responsibilities for data monitoring, collection, data archiving and calibration of equipments for these project activity instances. The team comprise will follow the below participators.

The monitoring activities will involve data collection during distribution as well as usage information post distribution. The data collected during distribution also involves information about the stove, the end user and location to enable one to uniquely identify each ICS unit and avoid double counting.

Repair and Maintenance - EKIESL/it,s representative will establish service center at project location where end users can repair the cook stoves and can use further. The repair and maintenance will be followed as per manufacturer recommendation. This will ensure that cook stove will operate for longer period. After 7 years of lifetime, a report from Maintenance Company will be provided to confirm the extended life of cook stove. The project will claim credits beyond 7 years only for balanced year till cook stove is replaced by new cook stoves.

EKIESL/it,s representative will distribute the stoves, as well as carry out the monitoring activities that occur during the distribution of stoves. EKIESL or through their associates will ensure that the distributor is trained on how to capture the end user data. The project activity implementer is fully responsible to ensure the correct distribution process and data gathering is followed.

The following information will be recorded at the time of distribution of ICS to the user and captured parameter for each improved cookstoves will be[6] :

- Name of the User/beneficiary
- Total Family Members
- Location/Address
- Geographic area of distributed cookstoves

[6] Since the improved cookstoves are not sold therefore sales related information are not included

- Installation Date
- Unique ID (Cookstove ID for each device)
- Cook stove model/ technology
- Efficiency of the improved cookstoves distributed

In addition, the project activity will also record the total number of improved cookstoves distributed. Once ICS are distributed, monitoring activities will involve selecting a sample of stove from the distribution record and visiting the premises where these stoves are located to monitor key parameters pertinent in ER Calculation. The individuals carrying out the monitoring activities will follow instructions provided during training, to check and record the following key parameters:

- Check if project stoves are operational and in use
- Check if there is any on-going use of replaced stoves.

Check biomass consumption of new cookstove Data collecting & handling is conducted in a transparent way to secure high quality of recording and storing of data. Data collected and monitored are stored electronically in a secure and retrievable manner for at least two years after the end of the project crediting period. Uncertainty related to data handling (if any) would be rectified, if necessary by revising monitoring procedures. The changes would be approved by a verifier (e.g. Designated Operational Entity)

Roles and responsibilities of different participators are proposed to be as follows:

Entity/Person	Roles & Responsibilities
EKIESL	✓ VCS documentation development ✓ Communicate with VERRA for all VCS related matters ✓ Communicate with DOEs for validation & verification ✓ Identify local partners for local representation and support ✓ Identity suitable ICS manufacturers ✓ Design the distribution plan for on ground implementation of ICS ✓ Design the monitoring system (including data collection in an electronic database) ✓ Training and development of local resources (as may be required) ✓ Regular Monitoring and quality assurance of data ✓ Monitor & Supervise on-ground distribution, etc. ✓ Annual Review meeting with Local Teams and other associated entity in order to ensure continuous improvements of the project activity
Distributor / Operational Team (Local Representative)	✓ To support & assist EKIESL in achieving the stated goal of the project activity ✓ Assist and facilitate EKIESL in baseline data collection, efficiency testing, data of biomass consumption for new ICS through sampling survey etc.

	✓ To be the local representative and communicate, act and engage in implementation activities of projectactivity ✓ To identify and deploy suitable local team and resources for ICS distribution, data collection, regular spot-check at households etc. ✓ Assist and facilitate EKIESL during training of the Operational Team and capacity building across the end users. ✓ To bridge any gap in between end users of ICS and EKIESL in order to ensure smooth operation of the program to achieve overall objective of the projectactivity ICS Distributor(s) – who will be responsible for deploying the ICS at household and register the end user in the digital tool. They will also be responsible for giving demonstration of ICS use, discussing with the end users on its benefits and educate them on continued use of ICS and discontinuation of the use of conventional/traditional open firing practice. They will also conduct periodic check at households to gather feedback, address to any technical concerns, collect necessary data and transmit the information.
ICS Manufacturer or Supplier	✓ To design and develop ICS as per required standard ✓ To provide technical parameters and manufacturer's efficiency etc. at the time ofsupply ✓ To educate and train EKIESL team on the installation (delivery), uses, handling etc. of the ICS at households.

Monitoring Responsibility

Data/Parameters	Monitoring Responsibility
Date of commissioning of batch j	1. Distributor / Operational Team (Local Representative) member is responsible for signing of end user agreement with beneficiary being hand overed with the improved cookstoves. The beneficiary information in the end user agreement will be transferred by Distributor / Operational Team (Local Representative) member in excel database/spreadsheet including the information relating to the commissioning. 2. The beneficiary as well as the commissioning data/information in the l beneficiary database/excel spreadsheet will be cross verified by EKIESL team member with the hard copy of the end user agreement to ensure correctness of data transfer.
Ny,i,j Number of project devices of type i and batch j operating during year y	1. EKIESL team member will be responsible for developing of the structured interview schedule/questionnaire, training of surveyors and cross verify the tabulated data with the original information schedule.

	2. The information will be collected by the team members of the Distributor / Operational Team (Local Representative) through sampling survey. The team members will also be responsible for data triangulation and data tabulation in excel spreadsheet. 3. The survey data/information in the excel /spreadsheet will be cross verified by EKIESL team member with the hard copy survey schedule to ensure correctness of data transfer.
$By=1,new,i,j,survey$ Quantity of woody biomass used by project devices in tonnes per device of type i. and batch j	1. EKIESL team member will be responsible for developing of the structured interview schedule/questionnaire, training of surveyors and cross verify the tabulated data with the original information schedule. 2. The information will be collected by the team members of the Distributor / Operational Team (Local Representative) through sampling survey. The team members will also be responsible for data triangulation and data tabulation in excel spreadsheet. 3. The survey data/information in the excel /spreadsheet will be cross verified by EKIESL team member with the hard copy survey schedule to ensure correctness of data transfer.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
Data unit	Number
Description	Number of project devices of type I and batch j operating during year y
Value applied:	<table><tr><th>Number of ICS distributed</th><th>Proportion of ICS operational (based on sample survey)</th><th>Number of ICS operational during the monitoring period</th></tr><tr><td>35,045</td><td>100%</td><td>35,045</td></tr></table> The ICS operational status based on 2nd year survey.
Comments	Proportion of operational stoves obtained from the survey is multiplied by the total commissioned stoves to arrive at this value.

	The survey will be conducted at least once every two years basis after implementation of project activity instance.

Data / Parameter	$B_{y=1,new,i,j,survey}$
Data unit	Tonnes
Description	Annual quantity of woody biomass used by improved cookstoves in tonnes per device of type i and batch j, determined in the first year of the implementation of the project through a sample survey
Value applied:	4.9 kg/device/day or equal to 1.825 tonnes/device/year Estimated based on survey result,
Comments	The survey is conducted in the first year of project implementation.

Data / Parameter	Date of commissioning of batch j
Data unit	Date
Description	To establish the date of commissioning, the Project Participant may opt to group the devices in "batches" and the latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch.
Value applied:	15/02/2020 (start date of distribution/ date of batch of ICS commissioned in the project activity). The start date of crediting period is considered from 15/02/2020 onwards
Comments	-

6.2 Baseline Emissions

The methodology does not account for baseline emissions separately, but instead quantifies net emission reductions achieved by the project. Please refer to Section 4.4.

6.3 Project Emissions

The methodology does not account for baseline emissions separately, but instead quantifies net emission reductions achieved by the project. Please refer to Section 4.4

6.4 Leakage

Leakage shall be considered as default 0.95 in accordance with methodology

6.5 Net GHG Emission Reductions and Removals

The below calculations are represented for project activity instance 1

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

$$ER_y = \sum_i \sum_j ER_{y,i,j}$$

Where:

i = Indices for the situation where more than one type/model of improved cookstove is introduced to replace three-stone fire

J = Indices for the situation where there is more than one batch of improved cookstove of type i

ERy = Emission reductions during year y in t CO2e

ERy,i,j = Emission reductions by improved cookstove of type i and batch j during year y in t CO2e

$ER_{y,,} = B_{y,savings,i,j} \times NCV_{wood\ fuel} \times f_{NRB,y} \times (EF_{wf,CO2} + EF_{wf,non\ CO2}) \times N_{y,i,j} \times 0.95$

Where:

$By,savings,i,j$ = Quantity of woody biomass that is saved in tonnes per improved cookstove of type i and batch j during year y

$fNRB,y$ = Fraction of woody biomass that can be established as non-renewable biomass (fNRB)5

$NCVwood\ fuel$ = Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne)6

$EFwf,CO2$ = CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO2/TJ)7

$EFwf,non\ CO2$ = Non-CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO2/TJ)8

Ny,i,j = Number of improved cookstoves of type i and batch j operating during year y

0.95 = Discount factor to account for leakage

The quantify of woody biomass saved due to implementation of improved cookstoves to be estimated using equation below (Equation 4 of methodology)

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

Where

η_{old} = Efficiency of baseline cookstove

$\eta_{new,y,i,j}$ = Efficiency of the improved cookstove type i and batch j determined through water boiling test (WBT) during year y

Alternatively, efficiency may be determined using below Equation

$B_{y=1,new,i,j,survey}$ = Annual quantity of woody biomass used by improved cookstoves in tonnes per device of type i and batch j, determined in the first year of the implementation of the project through a sample survey.

$$\eta_{new,i,y} = \eta_p \times (DF_n)^{y-1} \times 0.94$$

Where

η_p = Efficiency of project stove (fraction) at the start of project activity.

$(DFn)y-1$ = Discount factor to account for efficiency loss of project cookstove per year of operation (fraction). This value may be based on actual monitoring or based on manufacturer's declaration on expected loss in efficiency or through publicly available literature on relevant industry standards. Alternatively default value of 0.99 efficiency loss per year can be considered.

0.94 = Adjustment factor to account for uncertainty related to project cookstove efficiency test

For emission reduction calculation purpose, the below data is applied for first project activity instance.

1) The first project activity instance includes installation of 1 numbers of ICS.
2) The life span of ICS is 7 years; thus the operational lifetime of each project activity instance is taken as 7 years. This life may extend beyond 7 years with proper repair and maintenance. After 7 years of lifetime, a report from Maintenance Company will be provided to confirm the extended life of cook stove. The project will claim credits beyond 7 years only for balanced year till cook stove is replaced by new cook stoves.
3) The expected operational lifetime of each project activity instance will determine based on end date of commissioning of last ICS. If project activity includes, project activity instance wise installation, then ER should be estimated project activity instance wise.
4) Annual stove loss rate is 0% as per survey result.
5) $B_{y=1,\ new,i,\ survey,}$ is will be taken as per survey result .

The Actual ER calculations for sample first project activity instance is as below.
Determination of number of ICS operating during year y

$N_{y,i,j}$ = 1 x [1 - (y-1) x 0%]
Example of calculation:

If y = 2,
$N_{y,i,j}$ = 1 x [1 - (2-1) x 0%]
= 1

Hence, the number of ICS operating during year y is as below:

Year (y)	Ny,i,j
1	1
2	1
3	1
4	1
5	1
6	1
7	1

Determination of efficiency of ICS during year y

$\eta new,,,$ = ηp × $(DFn)y-1$ × 0.94
Where

ηp = 32.19%

DFn = 0.99

Example of calculation:

If y= 2

$\eta new,,,$ = 32.19% X (0.99)2-1 X 0.94

= 29.96%

Hence the efficiency of ICS during year y is as below:

Year (y)	$\eta new,y,i,j$
1	30.26%
2	29.96%
3	29.66%
4	29.36%
5	29.07%
6	28.78%
7	28.49%

Determination of quantity of woody biomass that is saved in tonnes per ICS during year y

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

Example of calculation: If y= 1,

$B_{y,,,}$= 1.785 X [(0.3026/0.1) -1]

= 3.62 tonnes per improved cook stove

Period	$By=1,new,i,survey$	$\eta new,y,i,j$	ηold	$By,savings,i,j$
15/02/2020 to 31/12/2020	1.7885	30.26%	0.1	3.62
01/01/2021 to 31/12/2021	1.7885	29.96%	0.1	3.13

Project Activity Instance 1:

The summary for project activity instance 1 is as below

Period from	Period to	Number of Day during period of Y Year	Number of ICS operating during year y	Efficiency of ICS during year y	Quantify of woody biomass saved	Emission reductions by ICS
			Ny,i,j	$\eta_{new.y.i.j}$	$B_{y.savings.i.j}$	
15-02-20	31-12-20	313	1	30.26%	3.63	186,635
01-01-21	31-12-21	365	1	29.96%	3.13	218,312

The Vintage wise summary for all project activity instances are as below

Emission Reduction for the Project Activity Instances

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
15/02/2020 - 31/12/202020	186,635	0	0	186,635
01/01/2021 - 31/12/2021	218,312	0	0	218,312
Total	**404,947**	**0**	**0**	**404,947**

There is no any separate calculations for baseline emissions, project emissions and leakage emissions, and methodology directly calculates emission reductions. Hence same emission reductions are based as baseline emissions in above table.

Comparison of the ex-ante and ex-post realized net GHG emission reduction

Estimated ex-ante emission reduction for the monitoring period (15/02/2020-31/12/2021)	Actual emission reduction for the monitoring period (15/02/2020- 31/12/2021)
412,421 tCO_{2e}	404,947 tCO_{2e}