INSTALLATION OF HIGH EFFICIENT COOK STOVES BY EKI ENERGY SERVICES LIMITED

Document Prepared by

EKI Energy Services Limited

Project Title	Installation of High Efficient Cook Stoves by EKI Energy Services Limited
Version	04
Report ID	EKI-2664 MP02
Date of Issue	01-April-2023
Project ID	VCS 2664
Monitoring Period	01-January-2022 to 31-December-2022 (both days included)
Prepared By	EKI Energy Services Ltd.
Contact	Address: Office no. 201, Plot 48, Scheme 78 part 2 Vijay Nagar, Near Brilliant Convention Centre, Indore - 452010 (M.P, India) Email: ramkrishna.patil@enkingint.org & registry@enkingint.org Telephone: +91 99075 34900 **Website: www.enkingint.org**

CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status 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 are in Assam state of India and details are provided in Section 1.7 of this document.

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 first project activity instance (ICS) was installed on 15-February-2020 under this project activity. total 35,045 ICS have been installed till the end of current monitoring period i.e., 31-December 2022. The first monitoring survey was conducted on 27-June 2021. The same monitoring survey is still applicable for the current monitoring period as the monitoring frequency is applied as biennial for this project & no new project activity instance has been installed after the first monitoring period.

The project results in a total emission reduction of 215,035 tCO_{2e} over the monitoring period of 01-January-2022 to 31-December-2022.

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 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

1.4 Other Entities Involved in the Project

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

Organization name	N/A
Role in the Project	N/A
Contact person	N/A
Title	N/A
Address	N/A
Telephone	N/A
Email	N/A

1.5 Project Start Date

15-February-2020 (The earliest date of commissioning of 1st ICS distributed for the project activity instances)

1.6 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.

1.7 Project Location

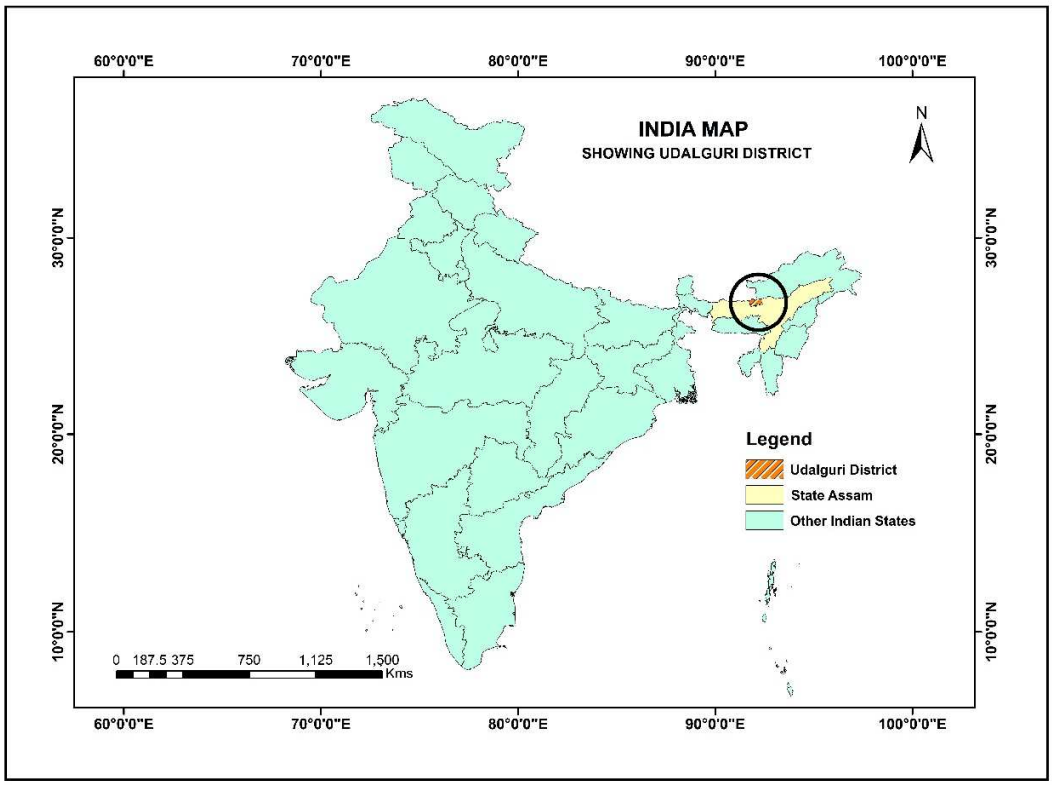
All the project activity instances in the proposed grouped project activity are located within geographical boundaries of Indian states of Assam in Udalguri district.

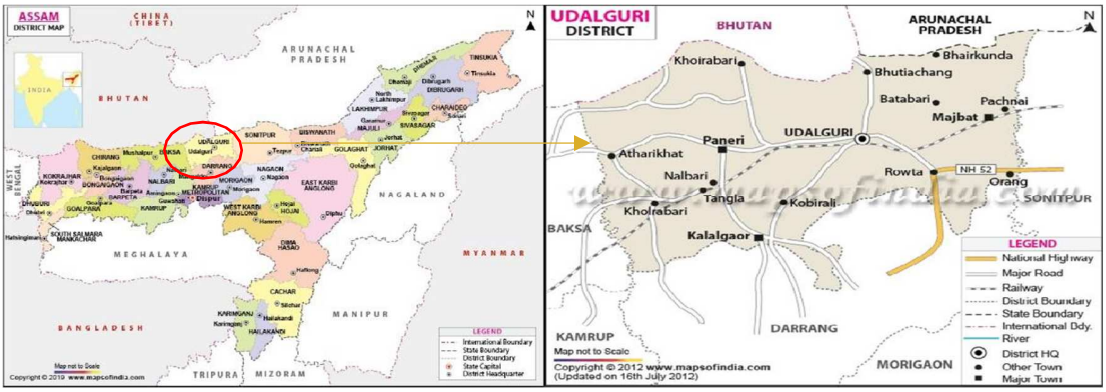
The geographical boundary for projects located in Udalguri district of Assam and is delineated in the form of extreme geographic coordinates of Udalguri district of Assam as follows:

Latitude – 26°46′ NorthLongitude – 92°08′ East

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

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





1.8 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 3.0

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

1.9 Participation under other GHG Programs

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

The project has not been rejected by any other GHG program.

1.10 Other Forms of Credit

- **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.
- **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.

1.11 Sustainable Development Contributions

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) 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 andtravel long distances to collect fuel wood.
2. Improves overall health of women and children by reducing smoke in the kitchen, thusreducing 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 project 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[1]. One of the priorities set out in the vision document

[1] https://transdev.assam.gov.in/sites/default/files/portlet/level_2%5Bcurrent-domainmachine-name%5D/ASSAM_2030_Our_Dream___Our_Commitment.PDF

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.) reduce the incidence of morbidity and mortality due to diseases triggered by indoor air pollution.

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[2], 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 aspublished by Niti Ayog will be used to assess the impact on SDG.

[2] SDG-India-Index-2.0.pdf (niti.gov.in)

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	3.9	Project specific indicator: Reduction in PM2.5 emissions	Use of ICS will decrease household air pollution	Reduce the fine particulate matter (PM2.5) in 35,045 households emitted during cooking thereby improving overall health outcomes and reducing burdens of disease.	Reduce the fine particulate matter (PM2.5) in 35,045 households emitted during cooking thereby improving overall health outcomes and reducing burdens of disease.
2)	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.
3)	8.3	Project specific indicator: Total Number of jobs created.	Implemented activities to increase	Provided employment to 210 personals including females for post implementation monitoring activity	Employment provided to around 65 male and 10 female personals for stove manufacturing unit. Employment provided to around 110 male and 25 female personals for ICS distribution and monitoring activity

4)	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 215,035 tonnes of carbon-dioxide in the atmosphere during the monitoring period.	Prevented the release of 619,982 tonnes of carbon-dioxide into the atmosphere.
5)	15.2	15.2.1 Progress Towards Sustainable Forest Management	Implemented activities to decrease	Contribute in reduction of deforestation of 103,202 tonnes of woody biomass from forests surrounding the communities and reducing pressure on forest reserves	Reduced deforestation of 359,952 tonnes of woody biomass from forests surrounding the communities and reducing pressure on forest reserves

2 SAFEGUARDS

2.1 No Net Harm

The project only brings positive impacts on environmental and socio-economic aspects as elaborated in Section 1.11 above. 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.

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.

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. PP did not receive any feedback from the stakeholders for the current monitoring period.

2.3 AFOLU-Specific Safeguards

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

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

Till the end of monitoring period, the project installed 35,045 stoves under project instance. Only one stove model (AGNEEKAA ECO MINI STOVE MODEL 4) was distributed in the project.

VCS methodology VMR0006, version 1.1 allows the use of a correction factor of 0.95 applied to the overall emissions reductions to account for any possible leakage. This factor has been applied to the emission reductions presented in this report

During the current monitoring period, no incident or event occurred, that could affect GHG emissions reduction and approved monitoring plan.

3.2 Deviations

2.1.1 Methodology Deviations

The project did not apply any methodology deviations

2.1.2 Project Description Deviations

EKI is seeking the following deviation in the registered PD:

- In the approve joint PD & MR section 5.1, the monitoring parameter "Date of commissioning of batch j" is not applicable, because EKI has considered each ICS as one instance, installed under this grouped project activity. And batch concept is not applicable. Therefore, the monitoring parameter "Date of commissioning of batch j" is not relevant & hence removed in the MR.
- In the approve joint PD & MR section 5.3 "monitoring plan", the parameters "date of commissioning of batch j or project activity instance" & "date of commissioning of project device" will be monitored from the distribution database and need not to be monitored through onsite monitoring using a sampling approach. Therefore, these parameters need not to be mentioned under section 4.3 of the MR.
- In the approve joint PD & MR section 5.3 "monitoring plan", the frequency of the internal audit is mentioned as six months. This is not the compliance requirement as per the applied methodology. Therefore, EKI has removed the frequency from the section 4.3 of the monitoring report. Although, as and when required, EKI will plan to conduct the internal audit to check the availability, performance and/or discrepancies/nonconformities in usage of the installed ICS.

3.3 Grouped Projects

New project activity instances included under this grouped project ensure that it meets the eligibility criteria below

No.	Criterion	How the new project activity instances comply the requirement
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 of approved

		joint PD & MR, where the target of the end-user is household and the ICS deployed is at least 25% of thermal efficiency.
2	Use the technologies or measures specified in the project description.	The technology used for project activity is energy efficient cook stoves. Only one model (AGNEEKAA ECO MINI STOVE MODEL4) of energy efficient cook stoves has distributed under this project activity.
3	Apply the technologies or measures in the same manner as specified in the project description.	Only energy efficient cook stoves adopted in the project by replacing traditional cook stoves in household.
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 Indian states of Assam in Udalguri district subject to the same baseline scenario determined in Section 3.4 of the approved joint PD & MR.
5	Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.	Included project activity instances 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 Under this project the ICS were installed at zero cost to the household and has no other source of revenue other than the sale of GHG credits. Therefore, the project activity instances comply with criterion 1 of positive list conditions of the methodology.
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:	No project activity instance shall exceed the applicable limit, which is 180 GWh_{th}/y. Since the project activity instances have same model, hence expected annual energy saving for each instance is 0.0145 GWh_{th}/y which is 0.008% of the threshold limit.

	Each project activity instance 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.	As the annual energy saving is below 1% of the limit, therefore no project activity instance is identified and divided into clusters.

Along with above points, the Project Activity Instances follows below criteria

No.	Criterion	How the new project activity instances comply the requirement
1	Occur within one of the designated geographic areas specified in the project description	Included project activity instances (Energy Efficient Cook Stoves) occurred in the geographic boundaries of Indian states of Assam in Udalguri district, as specified in approved joint PD & MR.
2	Comply with at least one complete set of eligibility criteria for the inclusion of new project activity instances. Partial compliance with multiple sets of eligibility criteria is insufficient.	Included project activity instances comply with complete set of eligibility criteria as mentioned above.
3	Be included in the monitoring report with sufficient technical, financial, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and enable sampling by the validation/verification body.	project activity instances information have been included in the current monitoring report with sufficient technical, financial, geographic and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and enable sampling by the validation/verification body

No.	Criterion	How the new project activity instances comply the requirement
4	Be validated at the time of verification against the applicable set of eligibility criteria	New project activity instances should be included by validating eligibility criteria as mentioned in this document
5	Have evidence of project ownership, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance (i.e., the date upon which the project activity instance began reducing or removing GHG emissions)	Ownership of included project activity instances is evidenced from start date of respective project activity instance.
6	Have a start date that is the same as or later than the grouped project start date	Start date of included project activity instances are after the start date of grouped project activity.
7	Be eligible for crediting from the start date of the instance through to the end of the project crediting period (only). Note that where a new project activity instance starts in a previous verification period, no credit may be sought for GHG emission reductions or removals generated during a previous verification period (as set out in Section 3.4.4 of VCS standard version 4.1) and new instances are eligible for crediting from the start of the next verification period	Included project activity instances are eligible to claim credits from crediting period start date to the end of the project crediting period.

4 DATA AND PARAMETERS

4.1 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 has been determined ex-ante. As per Methodological tool 30 ver. 03: Calculation of the fraction of non-renewable biomass. As per of methodological tool, value is calculated as perfollowing Equation (1), fNRBy = NRB/(NRB+DRB)
Purpose of Data	Calculation of emission reductions
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 emission reductions
Comments	-

Data / Parameter	$EF_{wf,CO2}$
Data unit	tCO_2/TJ
Description	CO_2 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	tCO_2/TJ

Description	Non-CO_2 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 has been used as the 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. 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 has been determined ex-ante
Purpose of Data	Calculation of $\eta_{new,y,i,j}$
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 has been determined ex-ante
Purpose of Data	Calculation of $\eta_{\mathbf{new},y,\mathbf{i,j}}$
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	Applicable vintages for all the implemented instances = vintage 3 Therefore, applicable efficiency of ICS = 29.66%
Justification of choice of data or description of measurement methods and procedures applied	This parameter has been 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: $\eta_{new,y,i,j} = \eta_p \times (DF_n)^{y-1}$ x 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 will be determined during verification and same will be considered for that project activity instance.

4.2 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 to be 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 monitored	35,045
Monitoring equipment	Sample survey.
QA/QC procedures to be applied	-
Purpose of the 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 households 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 was in line with the Section 8.4 option (b) of the applied methodology VMR 0006 ver. 01.1. 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 sample survey.
Frequency of monitoring/recording	Determined in the first year of project implementation.
Value monitored	1.7885
Monitoring equipment	Weighing scale.
QA/QC procedures to be applied	Survey team had purchased the new scales at the time of monitoring. Therefore, the instruments were pre-calibrated by the manufacturer.
Purpose of the data	Calculation of emission reductions
Calculation method	This is monitored parameter
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 monitored	7 years
Monitoring equipment	NA
QA/QC procedures to be applied	*NA*
Purpose of the data	Calculation of $\eta_{\mathbf{new},y,\mathbf{i},\mathbf{j}}$
Calculation method	*NA*
Comments	*NA*

4.3 Monitoring Plan

Monitoring Approach

In accordance to applied Methodology (VMR 0006: 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 guidelines of the 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	$N_{y,i,j}$ 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 years)

2	$B_{y=1,new,i,j,survey}$ Quantity of woody biomass used by project devices in tonnes per device of type i. and batch j	Measured value using weighing scale	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 years)

Sampling Approach

Target Population

The target population was 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.

All the instances (ICS) implemented under this project were considered as the total population to determine the sample size and a single survey was undertaken to collect data. Samples were drawn by using the random number generator.

To determine the parameters, sampling involved 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 (Yes/No)

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

Sample Size:

Minimum 100 samples were targeted to conduct the survey in accordance to the section 8.4 (b) of the applied methodology. Therefore, total 125 samples were selected considering 20% non-response using random sample selection method.

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 CDM project activities and programme of activities, if there is more than one parameter to be estimated, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen as sampling effort with one common survey, or separate sampling efforts and surveys are undertaken for each parameter. The project proponent selected the combined samples for the monitoring parameters i.e. $N_{y,i,j}$, $B_{y=1,new,i,j,survey}$ and baseline cookstove usage.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. Therefore, project proponent has selected 20% over samples during samples selection.

Sampling Frame

The sampling frames has been defined as per below. In overall, each ICS has same group of end users which is household users with similar cooking need and geographical location, thus it is confirmed 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.

Data to be collected as part of Sampling:

Field Measurement:

125 samples were surveyed[3] for all monitoring parameters using section 8.4 option (b) of the applied methodology VMR0006. The objective of the survey was to obtain reliable and unbiased estimates of the monitoring parameters.

A single homogeneous population was considered for the three parameters.

The following table summarizes the sample sizes and results.

[3] Supporting documents related to the survey along with the survey results sheet have been submitted to VVB for verification

Parameter	Timing (indicative)	Result	Methods to be applied	Comments on seasonal fluctuation
$N_{y,i,j}$	Monitoring will likely occur every 12 to 24 months	100%	Visits to the premises, visual inspection and interview with ICS end-user.	Not affected due to any seasonal fluctuation.
$B_{y=1,new,i,j,survey}$	Monitoring has occurred within the first year after installation	1.7885 Tonnes/year/stove	Visits to the premises, visual inspection, interview with ICS end-user and estimation of the daily consumption of woody biomass of ICS.	Not affected due to any seasonal fluctuation.
Baseline cookstoves usage	Monitoring will likely occur every 12 to 24 months	0%	Visits to the premises, visual inspection and interview with ICS end-user.	Not affected due to any seasonal fluctuation.

Soft copies of the surveys have been kept and the database has back up. Original stove purchase contracts, information collected from the registration or other means of acceptance by the users were stored in the project office. A back-up of the project database is also stored in an electronic medium. All data monitored and required for verification & 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 has applied measures to ensure the sampling requirement 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 depend on the cost of each data collection approach and logistics required. The project proponent determined the most effective measure for each parameter from the following list:

- Oversampling: Randomly drawn a sample more than the calculated number (20%) and collect data from the entire population
- Buffer Group: Randomly drawn additional samples (20%) and collected data from the selected samples meeting the minimum numbers of ICS as per sample size calculation.

The sampling plan has the following procedures in place to ensure good quality data. The project proponent ensured that field personnel have reviewed, understood 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 was documented. Quality control and assurance strategies included addressing non-sampling errors, such as non-response or bias from interviewer. The project proponent with the proper skills was trained the monitoring personnel on how to properly survey households to prevent bias from interviewer. In the case a household refuses to participate, another household was chosen at random. To reduce interviewer bias, good questionnaire design and well-tested questionnaires was used.

Data Review and Tabulation

At the first step data related to users/beneficiary information and result of survey was reviewed /triangulated and thereafter tabulated in database/excel spreadsheet by the teammembers 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 was 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 managed a project database that includes the following data that can be directly attributable to each instance within the project, thereby allowing unambiguous determination of the emission reductions attributable to each project:

- A list of households participating in the 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 was used to estimate proportions and mean values for the parameters described above. The values were then 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 to 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 followed 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.
Baseline cookstoves usage alongwith the project stove

Sampling for the purpose of emission reduction calculation and elaboration of the monitoring report was conducted in the month of June 2022 and is valid for current monitoring period. This sampling was conducted by trained personal from project proponent. 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 bi-annual monitoring. The project proponent is responsible for managing household data collection and entry into the project database. Field personnel have received the training on how to properly deal with surveying techniques and reduce errors and ensured that there is no conflict

of interest of those involved in data collection and analysis. The project database has the record of the implementation date, end user name and address of each ICS installed.

Appropriate record keeping procedures has been implemented to ensure that each monitoring period data set can be transparently attributed to its corresponding project, preventing any occurrences of double counting. An internal review of the project database is able to determine the current status of each ICS — 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.

(i) 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 ensured that those who have received an ICS are using it properly and that the conventional open fire is no longer in use.

(iii) Monitoring Reporting

The project proponent assessed all monitoring data and produced a monitoring report for the VVB to verify corresponding to the preceding monitoring period. This report presents 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 equipment 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 were recorded at the time of distribution of ICS to the user:

- Name of the User/beneficiary
- Total Family Members
- Location/Address
- Geographic area of distributed cookstoves
- Installation Date
- Unique ID (Cookstove ID for each device)
- Cook stove model/ technology

In addition, the project activity recorded 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 afterthe 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., Validation & verification body)

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 engagein implementation activities of project activity ✓ 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 project activity 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 of supply ✓ 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.
$N_{y,i,j}$ 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.
$B_{y=1,new,i,j,survey}$ Quantity of woodybiomass used byproject 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.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 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 of the approved joint PD & MR.

5.2 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 of the approved joint PD & MR.

5.3 Leakage

Leakage shall be considered as default 0.95 in accordance with methodology

5.4 Net GHG Emission Reductions and Removals

The below calculations are represented for project activity

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
ER_y	=	Emission reductions during year y in t CO_2e
$ER_{y,i,j}$	=	Emission reductions by improved cookstove of type i and batch j duringyear y in t CO_2e

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

Where:

$B_{y,savings,i,j}$ = Quantity of woody biomass that is saved in tonnes per improved cookstoveof type i and batch j during year y

f_{NRB} = Fraction of woody biomass that can be established as non-renewable biomass (f_{NRB})[4]

$NCV_{wood\ fuel}$ = Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne)[5]

$EF_{wf,CO2}$ = CO_2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO_2/TJ)[6]

$EF_{wf,non\ CO2}$ = Non-CO_2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO2/TJ)[7]

$N_{y,i,j}$ = Number of improved cookstoves of type i and batch j operating during year y

0.95 = Discount factor to account for leakage

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

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

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

[4] Default values endorsed by designated national authorities and approved by the Board are available at https://cdm.unfccc.int/DNA/fNRB/index.html

[5] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1Introduction

[6] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

[7] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

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

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 orbased 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 beconsidered.

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

$B_{y=1,new,i,j,survey}$ = 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.

The Actual ER calculations for sample project activity instance are as below .

PP has calculated the emission reduction for each ICS installed under the project activity separately. In this section example for ER calculation of one ICS (stove serial number 100008) is provided:

For year 2022

Date of installation: 15-February-2020

For year 2022, vintage for the stove: Vintage 3

No. of days for vintage 3: 365 (01-January-2022 to 31-December-2022)

Year fraction: 365/365 = 1

Determination of efficiency of ICS during year y

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

Where

η_p = 32.19%

DF_n = 0.99

Example of calculation:

If y= 3

$\eta_{new,y,i,j}$ = 32.19% X (0.99)1$^{(3-1)}$ X 0.94

= 29.66%

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

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

Example of calculation:

If y= 3,

$B_{y,savings,i,j}$= 1.7885 X [(0.2966/0.1) -1]

= 3.5156 tonnes

Period	$B_{y=1,new,i,survey}$	$\eta_{new,y,i,j}$	η_{old}	$B_{y,savings,i,j}$
01-January-2022 to 31-December-2022	1.7885	29.66%	0.1	3.5156

Determination of emission reductions for 1 instance by ICS of year1 during year y

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

Where,

$NCV_{wood\ fuel}$ = 0.0156 TJ/tonne

$f_{NRB,y}$ = 0.852

$EF_{wf,CO2} + EF_{wf,non\ CO2}$ = 112 + 26.23 = 138.23 tCO_2/TJ

Example of calculation:

for y = 3

$ER_{y,i,j}$ = 3.5156 X 0.0156 X 0.852 x 138.23 X 1 X 0.95 X 1

= 6.136 tCO_2

Therefore, for all project activity instances installed till end date of monitoring period under this project:

$ER_{y,i,j}$ = 215,035 tCO_2

The summary for project activity instances is as below

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)
01-01-2022 to 31-12-2022	215,035	0	0	215,035
Total	**215,035**	**0**	**0**	**215,035**

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 3rd year	Actual emission reduction for the monitoring period (01-January-2022- 31-December-2022)
215,035 tCO2e	215,035 tCO2e