ENERGY EFFICIENT COOK STOVE IMPLEMENTATION IN INDIA

Document Prepared By

Enen Green Services Private Limited

Project Title	Energy Efficient Cook Stove Implementation in India
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Prepared By	Enen Green Services Private Limited
Contact	Enen Green Services Private Limited Ruchika Sharma D- 30 A, FF, Ashoka Enclave, Sector 35, Faridabad, Haryana. Contact Number : 09953935506

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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project activity involves promotion of improved cooking stoves (ICS) to the people of socially deprived community in India. The project intends to avail the households with clean cooking solutions; thereby, displacing the less efficient traditional cooking stoves from the kitchen with stoves of better efficiency. Replacement of the traditional cooking stoves with ICS will reduce the exposure of the family members, specifically women, to the indoor air pollution and therefore result in saving of health related expenses.

The estimated annual average emission reductions over a 10 year period of first crediting period are 58,944 tCO2e/year. The total emission reductions for 10 years crediting period will be 589,441 tCO2e. Total GHG emission reduction in first monitoring period 28thJune2019 to27th June2020 is **33,439 tCO_2e.**

To achieve the initial targeted volume of emission reductions, the project proponent aims to disseminate 25,520 ICS under the project activity. Project started distribution from June 2019 and last batch distributed on Jan 2020. All ICS taken account under the project activity are commissioned. Whereas during the monitoring found that only 17,379 devices are in operational.

Scenario existing prior to the implementation of project activity: The scenario existing prior to the implementation of the project activity instances is the usage of traditional biomass and inefficient cook stoves with poor ventilation, causing excessive indoor air pollution (IAP) and has been a serious health risk for women and children who spend several hours in the kitchen.

1.2 Sectoral Scope and Project Type

The project activity under consideration is not a grouped project activity.

Sectoral Scope: 03 Energy Demand.

Project Type: Type II Energy Efficiency Improved Projects

Grouped Project: No

1.3 Project Eligibility

According to VCS Standard, version 4.1, the scope of the VCS Program includes:

1) The six Kyoto Protocol greenhouse gases.

2) Ozone-depleting substances.

3) Project activities supported by a methodology approved under the VCS Program through the methodology approval process.

4) Project activities supported by a methodology approved under a VCS approved GHG program, unless explicitly excluded under the terms of VERRA approval.

5) Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements.

The project activity generated renewable electricity without any GHG emissions, which displaced part of the electricity otherwise been supplied by grid connected fossil fuel fired power plants generating mainly CO2 emission. Thus, GHG emission reductions can be achieved. The project is eligible under the scope (the six Kyoto Protocol greenhouse gases) of the VCS Program.

1.4 Project Design

Project is a single project activity not a grouped project activity.

Eligibility Criteria

Project activity is not a grouped project activity hence this is not applicable.

1.5 Project Proponent

Organization name	Enen Green services Private Limited
Contact person	Ruchika Sharma
Title	Director
Address	D- 30 A, FF, Ashoka Enclave,Sector 35, Faridabad, Haryana.
Telephone	09953935506
Email	enengreen@gmail.com

1.6 Other Entities Involved in the Project

Organization name	Greentech Environment
Role in the project	Project Implementor
Contact person	Mr. Viral Pushpavadan
Title	Founder

Address	22,23, Shree Rangkutir Shopping Center, Bholav, Bharuch, Gujarat-392012
Telephone	+91-8800420771
Email	ge@enengspl.com

1.7 Ownership

The improved cook stoves technology installed at site of each of the project activity as part of the project activity are under ownership of respective Green Tech Environment. Project implementor (Green Tech Environment) received carbon waiver from ICS users at the time of distribution of ICS devices. Carbon waiver declaration mentioned that Green tech environment can claim emission reduction of ICS devices for the life time of devices and user has no objection.

1.8 Project Start Date

The first ICS batch was commission on 28thJune 2019. Thus the project starts date is28/06/2019.

1.9 Project Crediting Period

Project Crediting Period: First

Start Date: 28/06/2019 (First operating day of the project activity ICS).

End date: 27/06/2029

Total Number of Years: 10 (Fixed)

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	x
Large project	

Year	**Estimated GHG emission reductions or removals (tCO_2e)**
2019 (From 28/06/2019 to 31/12/2019)	31,712

2020	59,964
2021	59,577
2022	59,577
2023	59,190
2024	58,803
2025	58,417
2026	58,417
2027	58,030
2028	57,643
2029 (From 01/01/2029 to 27/06/2029)	28,111
Total estimated ERs	**589,441**
Total number of crediting years	10
Average annual ERs	**58,944**

1.11 Description of the Project Activity

The project will be broadly implemented in the state Assam country India. Starting with implementation in June2019, it is envisaged to disseminate ICS to households within three districts Baksa, Udalguri and Barpeta. Districts in India are second level of administrative divisions after state. Districts are subdivided in tehsil. The Households in this region of the project activity are characterized by the consumption of the solid biomass based fuel. More than 62% of the rural households in these districts use firewood for cooking purpose. Similarly, another 29% use dung cake to meet their daily cooking energy requirements.
The majority of communities are rural and some lack direct road access. This combination of actors drives the high reliance on fuelwood as the primary source of cooking fuel. Despite high prevalence of biogas throughout India, the average penetration rates of biogas and LPG throughout the project boundary is less than 2% each and access to kerosene is also very limited mostly due to high fuel prices.

Project aims to reach disadvantaged people with the clean cooking solutions in form of ICS. Project implementer shall train people appropriately at the local level to cater the households with stove construction. Female stove makers will be trained to the extent possible. Once the installation completes, representatives from the implementing entity will perform paperwork and the stove is recorded in the database. The database will be maintained in MS Excel and contains the following information.

- Name of the User
- Total Family Members

- District
- District/tehsil and Village
- Date of purchase
- Unique ID

The project intends to disseminate a locally made smart ICS to the disadvantaged communities in the project district. The dissemination of ICS will happen phase wise and accordingly the ICS will be included in the project design.

District wise breakup of distributed cookstove:

State	District	Tehsil	No of Household
Assam	Baksa	Baksa	1300
		Goreswar	1450
		Jalah	1340
		Mushalpur	1440
		Rangia	1905
	Udalguri	Dalgaon	1200
		Dhekiajuli	2678
		Mazbat	1994
		Udalguri	2012
		Harisinga	2096
	Barpeta	Baghabore	1430
		Bajali	1750
		Barnagar	2425
		Barpeta	2500
			25520

Figure: Design of ICS

Technical Specification

Height	190 mm
Diameter	250 mm
Chimney	
Internal Diameter	105 mm
Outer Diameter	110 mm
Thickness	5 mm
Made up of red clay, treated at high temperature	700^{0}C
Outer Body	
Thickness	20 gauge
Black powder coated and treated at high temperature	
Total weight	4.5 kg

Used glass wood as insulator	

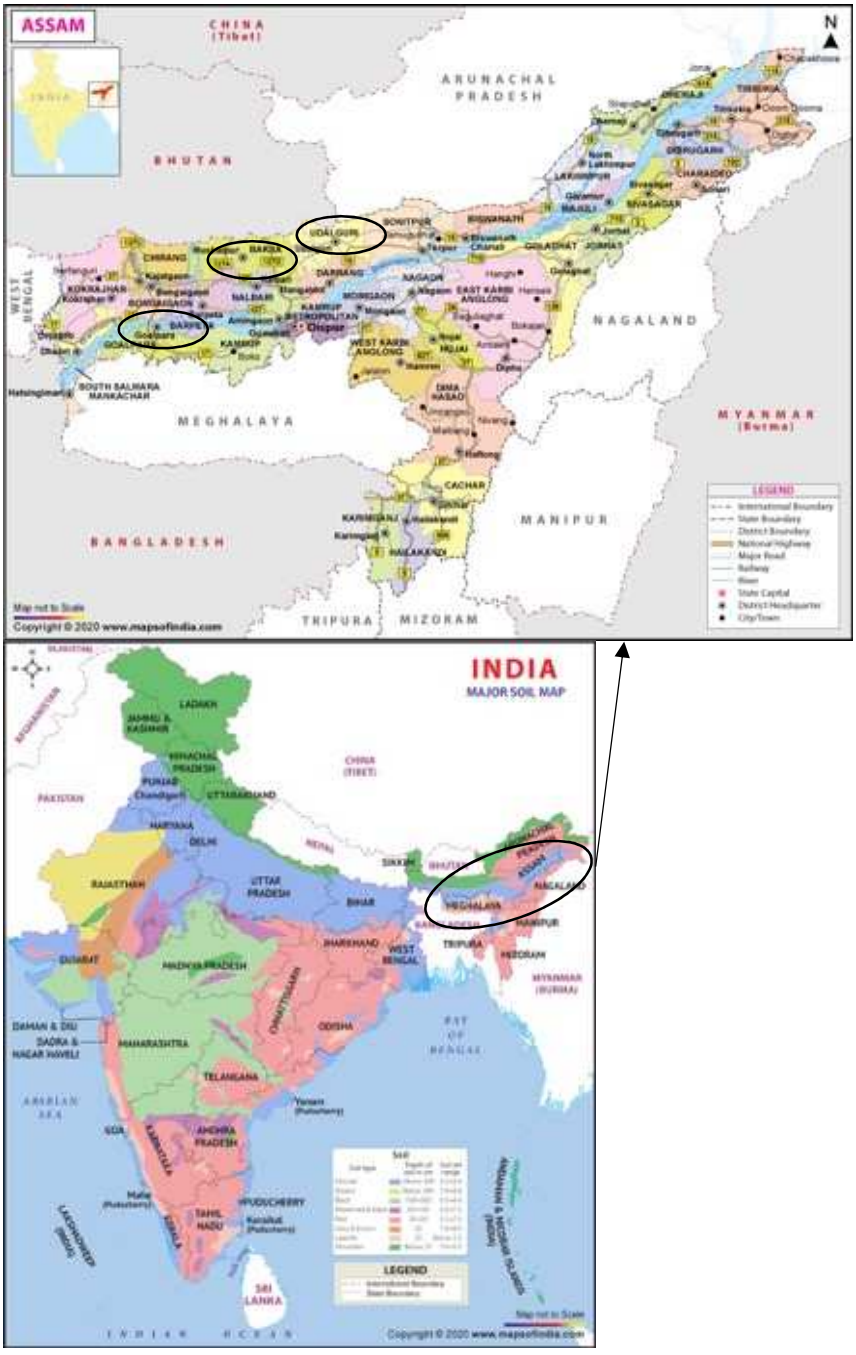
The project will promote smart stove which is an improved stove design. The main design improvement is the use of a prefabricated metallic or ceramic combustion chamber. This combustion chamber ensures consistent quality and durability of the ICS and will improve the lifespan of the stove with consistent performance in terms of efficiency, reduction of indoor air pollution and emissions, and safety. The metal or ceramic combustion chamber is surrounded by an isolative material, then the outer body is constructed in a cube shape, the stove incorporates an L-shaped combustion chamber and pot "skirt" to improve heat transfer and combustion efficiency during cooking activities. The combustion chamber consists of a horizontal fuel magazine and vertical internal chimney. Wood is fed horizontally into the fuel magazine ensuring even combustion from one end and a more easily regulated feed rate. The internal chimney creates draft, accelerating combustions gases from the fire. These gases are then forced through the skirt that surrounds the cook pot. Greater convective heat transfer is the result of improved advection and increased surface area contact. With the high power combustion, emission of indoor air pollutants is minimized rendering a smoke-free kitchen. It is pertinent to clarify that despite the project is eligible to earn credit for 10 years, a stove has a lifetime of 5 years which requires the stoves to be replaced after 5 years of installation.

1.12 Project Location

Project activity would be located in District Baksa, Udalguri and Barpeta of state Assam country India. Thus geographical area of project activity is considered as India. The geographical boundary is delineated in the form of extreme geographic coordinates as follows:

Latitude: 20.5937^{0}N

Longitude: 78.9629^{0}E



1.13 Conditions Prior to Project Initiation

The scenario existing prior to the implementation of the project activity instances is the usage of traditional biomass and inefficient cook stoves with poor ventilation, causing excessive indoor air pollution (IAP) and has been a serious health risk for women and children who spend several hours in the kitchen.

The proposed project activity reduces the use and demand for fossil fuels and non-renewable biomass that would have been used in the replaced stove to achieve the same output (i.e cooking daily meals and boiling hot water) with the ICS. This directly leads to reduced GHG emissions. Therefore, the project has been implemented to generated GHG emissions for the purpose of their subsequent reduction, removal or destruction.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

There exists no mandatory law or regulation in the host country requiring the introduction of ICS in India, therefore the project is a voluntary effort by the project proponent.

The project is in compliance with relevant laws, statues and other regulatory frameworks.

The project does not violate any laws, statutes and or other regulatory frameworks in India.

1.15 Participation under Other GHG Programs

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

The project activity has not been registered and is not seeking registration under any other GHG emission program to avail carbon benefits during the crediting period of the project activity.

1.15.2 Projects Rejected by Other GHG Programs

The project proponent hereby corroborates that the project activity has not been rejected by any other GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The net GHG emission reductions generated by the project activity will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions.

1.16.2 Other Forms of Environmental Credit

The project proponent hereby corroborates that the project activity has not created or sought or received any other form of environmental credit.

1.17 Additional Information Relevant to the Project

Leakage Management

The project does not involve any transfer of equipment from outside the project boundary to the project boundary. The project will use the stoves either built on site or manufactured by a

prequalified companies in India. Thus the provision on leakage associated with project boundary is not applicable.

Commercially Sensitive Information

All relevant information for the purpose of Project description is included in VCS PD. All the information disclosed to the validator has been provided in the public version of the report.

Sustainable Development

Project's contribution to Sustainable Development

The contributions of proposed project activity towards sustainable development are explained with indicators viz. social, economic, environmental, technological well-being, legislative and temporal as follows:

Environmental well-being

The project activity will result in the reduction of firewood consumption and emission of greenhouse gases and thus conserve forest and biodiversity.

Social well being

The project activity will pave the way for development and increases the social status and living conditions and the prevailing living standard in the vicinity of the project activity and thus results in empowering the nearby. Also it will contribute to a small increase in the local employment by employing skilled and un-skilled personnel for operation and maintenance of the equipment. The project will reduce the drudgery of women, time saving and the use of saved time for other productive activities.

Economic well being

The project has created a business opportunity during construction phase for local stakeholders such as suppliers, contractors etc. contributing to economic well-being aspects. Further, the project also influences creation of employment opportunities for local people, which would enhance their social status. Sufficiently enhance indoor air quality thereby improving health of women and children and reducing incidences of smoke and fire related injuries and therefore result in saving of health related expenses.

Technological well being

The proposed project activity will promote improved cook stoves that result in reduced fuel consumption and emissions due to cooking and heating water in homes.

Further Information

Legislative:

The Project Proponent has obtained all the relevant approvals required for the establishment and operation of the project activity

Temporal:

EGSPL has not applied for any other kind of renewable or carbon benefit anywhere else for the same.

2 SAFEGUARDS

2.1 No Net Harm

No potential negative environmental and socio-economic impacts have been identified by the project proponent. The project activity promotes environmental and socio-economic well-being. Also, project activity generated local employment which supports upliftment of socio-economic status of region.

2.2 Local Stakeholder Consultation

Invitations for stakeholder consultation meeting were sent out by Enen Green via an email and personal phone calls. Stakeholders were identified as those whose activities directly or indirectly impact the project, and those who were to be impacted by the project activities. Full lists of invitees and attendees submitted to VVB. Due to COVID-19 participation was less and PP also follow government guideline of social distancing and public gathering less than 50 persons.

Enen Green organized the stakeholder consultation meeting on 28th October 2020 at **Jalaram Mandir, Fatasil Ambari, Guwahati, Assam.** The meeting was attended by the teachers, students, consultants, suppliers, contractors, local NGOs and the local residents in the area. The objective of the meeting was to inform the stakeholders about the environmental and social impacts of the project activity and discuss their concerns regarding the same, if any. The comments and suggestions were invited throughout the period of Stakeholders meet.

The overall response to the project, from all invited stakeholders, was encouraging and positive. In all, no adverse reactions, comments, or clarifications were received during the Stakeholder Consultation process. The project participants did not recognize any need to make changes to the project design or monitoring plan. During the stakeholder consultation Enen Green share draft PD and MR with stakeholders and keep a copy of draft PD and MR with local supplier and village head to collect comment from local stakeholders. So far no comments have been received from local stakeholders. For ongoing communication with local stakeholder, users can record their grievance at local supplier or village head and this grievance directly taken care by project participants, same was communicated in stakeholder consultation meeting to local stakeholders.

2.3 Environmental Impact

- Environmental Benefits: Reduction in firewood consumption and emission of greenhouse gases, forest and biodiversity conservation.
- Economic Benefits: Employment creation and saving of health cost.
- Air quality: Sufficiently enhance indoor air quality thereby improving health of women and children and reducing incidences of smoke and fire related injuries.
- Social Benefit: Reduces drudgery of women, time saving and the use of saved time for other productive activities

2.4 Public Comments

The project was open for public comments from 21/09/2020 to 21/10/2020. Following comments has been received during public commenting period.

1. DOE should thoroughly verify each households and visit each households to check that the beneficiaries are using traditional cook stoves in the baseline. Also PP should provide detailed survey records as well as government reports to demonstrate that ICS penetration is less then 5%.

   PP Response: PP did third party survey of households and found that rural households don't have fund to purchase LPG therefore they are still using traditional stoves who consumes more firewood. Refer following literature[1] on adoption of firewood as major fuel in Assam.

2. The additionality demonstration is not correct, since para 18 of AMS II G, ver 11.1 states " Demonstrate ex ante that the penetration of ICS is equal to or less than 5 per cent of the technologies providing similar services in the region in order to be considered as automatically additional. ", so how PP has demonstrated the ICS penetration is less then 5%.

   PP Response: PP has changed methodology from AMS II G to VERRA methodology VMR0006 Methodology for installation of High efficiency firewood cookstove and explain additionality based on VMR0006 requirements.

3. How the monitoring survey was carried out is not clearly mentioned in the project document. PP should clearly describe the monitoring sampling plan along with other relevant information related to monitoring survey and sampling calculations.

[1] https://www.ppac.gov.in/WriteReadData/Reports/201710310449342512219PrimarySurveyReportPPAC.pdf

PP response: In revised PDD and MR PP has included detailed description of monitoring survey and sample calculation method.

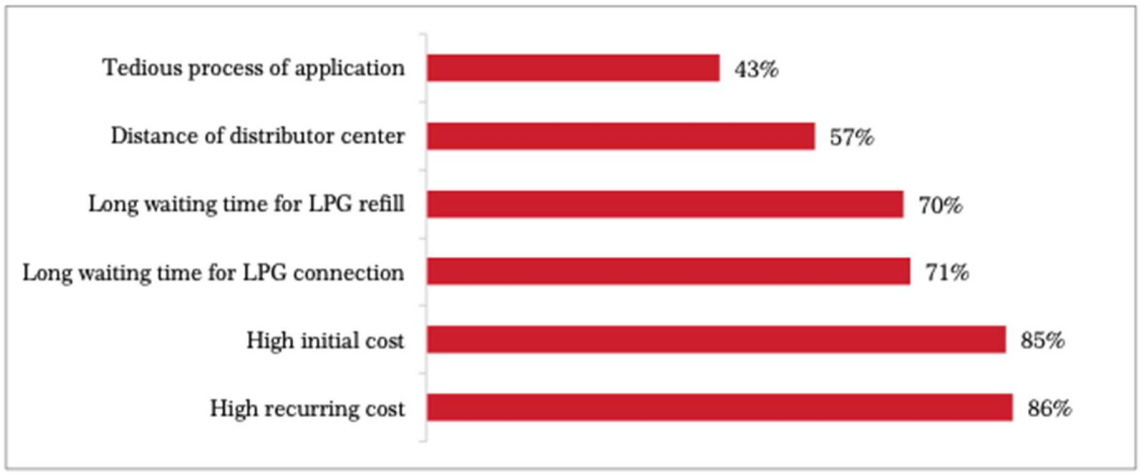
4. How fNRB value of 91% is calculated should be provided transparently in the project document along with all the relevant sources.

   PP response: PP has included fNRB calculation details in ER sheet with reference of source of data, which is cross verified by VVB and found it relevant.

5. Moreover, Indian prime minister initiatives on free distribution of LPG cook stoves is a huge success which are launched in 2016 and almost each and every households in India are having LPG connections. So the baseline usage of traditional inefficiency cook stove is contradictory.

   PP Response: All the households considered under the project activity are rural households and they didn't get gas connections. They don't have funds to purchase cookstoves or purchase subsidized cylinder which cost INR 700-INR 800. Therefore, PP is distributing these ICS free of costs.

   Above statement justified from Petroleum Planning & Analysis Cell survey of different states of India who is Ministry of Petroleum and Natural Gas body and work under government of India2. Result of survey confirm that there are multiple barriers with users to adopt LPG connection, High recurring cost of LPG refill (86%) and high initial cost (85%) of getting a connection (security deposit plus stove) are the top barriers in Assam, followed by long waiting time to get an LPG connection (71%) and LPG refill (70%). Further, addressing barriers related to distance of distributor centres (57%) and tedious process of application (43%) need to be addressed for better LPG penetration in Assam.



As project is mainly implemented in 3 districts of Assam, Baksa, Udalguri and Barpeta, survey document Annexure 2 clarified that Baksa has LPG penetration rate 25%, Udalguri has 17% and Barpeta has 48%. Therefore, main fuel of households is firewood they still not shifted to LPG due to higher costs.

[2] https://www.ppac.gov.in/WriteReadData/Reports/201710310449342512219PrimarySurveyReportPPAC.pdf

6. The identification of beneficiaries is not mentioned. What are the selection criteria's for beneficiaries identification/ target users. Whether any survey is conducted in the project area to demonstrate that in the baseline the beneficiaries are using traditional inefficient cook stoves.

   PP Response: Yes, PP did user survey in November & December 2018 with support of local gram panchayat and local village employees to identify the target users those who were using traditional inefficient cookstoves. Based on identified users PP distributed/implemented ICS devices. These local employees prepared a list of households from each village those who were using traditional cookstoves and don't have capacity to purchase new improved cookstoves. This list of households approved by gram panchayat then PP starts distribution of ICS based on list finalized by local employees and gram panchayat.

7. The little information provided in the project document on the project technology description, it has been observed that these type of ICS are in typical use in the project area and also across India, and are having efficiency between 13-18%, so how PP can demonstrate that the efficiency of these new ICS are more than 20%.

   PP Response: PP has included technology specification of ICS in section 1.11 of revised VCS PD and MR. ICS efficiency certified by third party testing lab which is verified by VVB during validation and verification process.

8. The type (single pot or double pot etc), fixed or portable etc / model/ make are not provided clearly in the project document. The efficiency of ICS is missing. Also, PP should provide test certificate from reputed government testing agency for ICS efficiency and life time of ICS.

   PP Response: ICS efficiency and life time included in Join PD and MR, testing certificate certified from third party agency also submitted to VVB during validation and verification process.

2.5 AFOLU-Specific Safeguards

Not applicable

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Title: Energy efficiency measures in thermal applications of non-renewable biomass
Type: Type II – Energy Efficiency Improved Projects
VMR0006 Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1[3]
Sectoral Scope: 03

[3] https://verra.org/methodology/vmr0006-methodology-for-installation-of-high-efficiency-firewood-cookstoves/

3.2 Applicability of Methodology

S. N.	VMR0006 Requirements	Project activity applicability
1.	Project activities shall be implemented in domestic premises or in community-based kitchen	The proposed project involves deployment of ICS only in households.
2.	The project stove shall have specified high power thermal efficiency of at least 25% per the manufacturer's specifications and shall exclusively use woody biomass and can be single pot or multi-pot;	Energy Efficient stoves planned to be installed under this project are single pot portable or an in-situ wood cookstoves that have an efficiency of 33.25% as per the manufacturer's specifications.
3.	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;	The non-renewable biomass has been used in the country since 31st Dec 1989. The information was derived from the literature survey.
4	For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips	Not applicable. The ICS is introduced as energy efficiency measure to replace baseline stoves and reduce the use of non-renewable biomass for combustion.
5	Monitoring approaches for $B_{savings,i,j}$ and values for parameters f_{NRB} (when Option (a) in paragraph 48(c) is chosen) and the quantity of woody biomass $B_{old,i,j}$ may be determined	Not applicable. The ICS is introduced as energy efficiency measure to replace baseline stoves and reduce the use of non-renewable biomass for combustion.

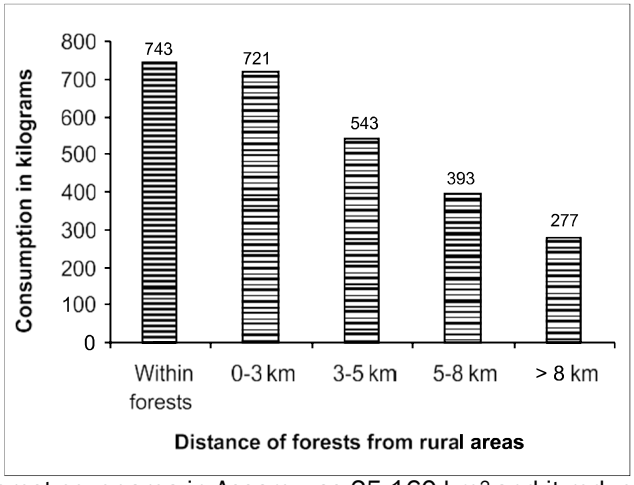
S. N.	AMS II G Version 11.1 Requirements	Project activity applicability
1	The CDM-PDD or CDM-PoA-DD/CPA-DD shall explain the proposed method for distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations (e.g. programme logo).	PP is recording following information at the time of distribution of ICS to the user: ▪ Name of the User ▪ Total Family Members ▪ District ▪ Tehsil/village ▪ Date of distribution ▪ Unique ID Name of the user and unique ID of ICS will avoid double accounting.
2	The CDM-PDD or CDM-PoA-DD/CPA-DD 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.	Project implementor (Green Tech Environment) received carbon waiver from ICS users at the time of distribution of ICS devices. Carbon waiver declaration mentioned that Green tech environment can claim emission reduction of ICS devices for the life time of devices and user has no objection.

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: Fuelwood has remained the principal component of rural domestic energy in India and in most developing countries. Most of the fuel wood has been reported to be derived from forests with some from trees growing on homesteads, farmlands, and common Lands outside forests. Because of the increasing population, the area under agriculture expanded and forests shrunk. In India, the Land under cultivation increased from 118million in 1951 to 142 million ha by 1987. This expansion also included the diversion of about 4.5 million ha of forests to agriculture. On the other hand, the demand for fuelwood increased in spite of the rapid growth in the commercial energy sector. Fuelwood consumption studies commissioned during the 1970s and 1980s revealed a widening gap between demand and recorded supply from the forests. Fuelwood prices were soaring.

The fuel wood consumption studies done by the Forest Survey of India in forested areas of the country also give high consumption rates, especially in the forest-rich states of Arunachal Pradesh, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The per capita fuel wood consumption ranged between 423 kg to 1320 kg (Rai and Chakrabarti1996).

Table 1: Per capita consumption of fuel wood in relation to distance from forests (Source: Anon1987a)[4]



In year 1987, Forest cover area in Assam was 25,160 km^2 and it reduces up to 23,688 km^2 in year 1999. However, Forest cover increases post 1999 and increases up to 27,671 km^2 in year 2013[5]. Therefore, it can be concluded that non-renewable biomass have been used in the project region since December 1989.

3.3 Project Boundary

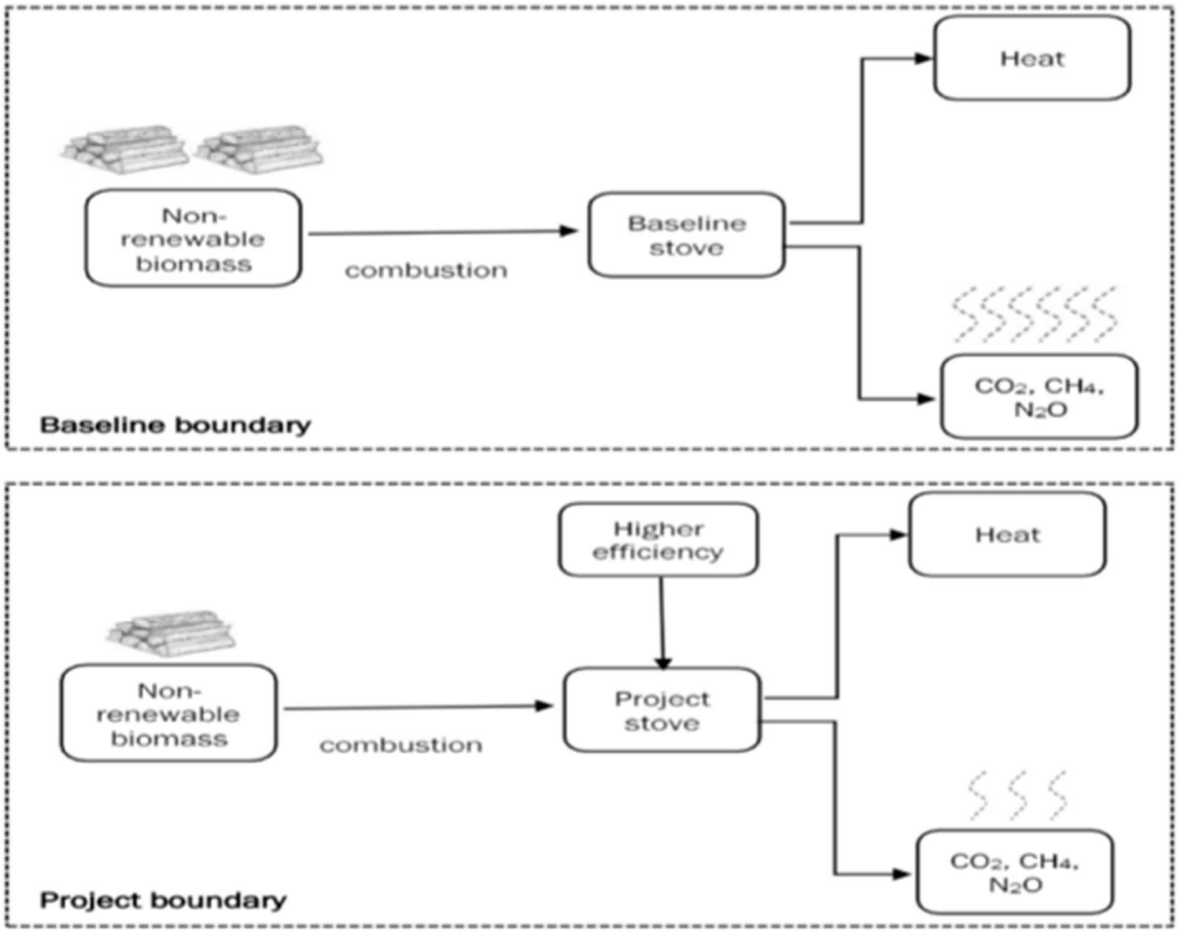
Project activity would be located within geographical boundaries of Republic of India.

[4] https://www.cifor.org/publications/pdf_files/Books/Fuelwood.pdf?q=fuelwood&q=fuelwood

[5] http://www.frienvis.nic.in/Database/Forest-Cover-in-Indian-States-and-Union-Territories_1825.aspx

Source		Gas	Included?	Justification/Explanation
Baseline	Combustion of non renewable biomass for cooking	CO_2	Yes	Major source of emissions
		CH_4	Yes	Major source of emissions
		N_2O	Yes	Major source of emissions
Project	Combustion of non renewable biomass for cooking	CO_2	Yes	Major source of emissions
		CH_4	Yes	Major source of emissions
		N_2O	Yes	Major source of emissions

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



3.4 Baseline Scenario

The actual baseline is the use of non renewable biomass. In absence of the project activities, the intended beneficiaries of the project would continue using the traditional inefficient cooking stoves, consuming high quantity of non-renewable biomass.

3.5 Additionality

The methodology VMR006 v1.0 uses activity method for the demonstration of additionality.

Activity Method

Step 1: Regulatory Surplus

There is no mandated government programme or policy in the host country of this project ensuring distribution of domestic fuel-efficient cookstoves. The project is not mandated by any law, statute or regulatory framework, or for the 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 Enen Green.

Step 2: Positive List
The applicability conditions of this methodology represent the positive list. The project meets all of the applicability conditions as described in Section 3.2. The project also meets the following conditions:
1. The project implemented or distributes stoves at zero cost to the end-user and has no other source of revenue other than the sale of GHG credits.
2. Project activities are not implemented as part of government schemes nor is the project supported by multilateral funds. The project can therefore be deemed as additional.

3.6 Methodology Deviations

No deviations from the applied approved methodology have been taken for the project activity.

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The methodology does not account for baseline emissions separately, but instead quantifies emission reductions as a function of the reduction in the amount of non-renewable biomass fuel consumption in the efficient project stoves as compared to baseline stoves.

4.2 Project Emissions

The methodology does not account for project emissions separately, but instead quantifies emission reductions as a function of the reduction in the amount of non-renewable biomass fuel consumption in the efficient project stoves as compared to baseline stoves.

4.3 Leakage

Leakage shall be considered as default 0.95 in accordance with Section 5.4 of AMS-II.G

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.

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

Where:
i = Indices for the situation where more than one type/model of improved cookstove is introduced to replace there 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 tCO_2e
ERy,i,j, = Emission reductions by improved cookstove of type *i and* batch *j* during year *y* in tCO_2e

$$ER_{y,i,j} = B_{y,savings,i,j} \times NCV_{wood\ fuel} \times f_{NRB,y} \times \left(EF_{wf,CO2} + EF_{wf,non\ CO2}\right) \times N_{y,i,j} \times 0.95$$ Equation (2)

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved in tonnes per improved cookstove of type i and batch j during year y
$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass (f_{NRB})
$NCV_{wood\ fuel}$	=	Net calorific value of the non-renewable woody biomass that is substituted or reduced(IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
$EF_{wf,CO2}$	=	CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO2/TJ)
$EF_{wf,non\ CO2}$	=	Non-CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO2/TJ)
$N_{y,i,j}$	=	Number of improved cookstoves of type i and batch j operating during year y
0.95	=	Discount factor to account for leakage

Determination of $B_{y,savings,i,j}$

The quantify of woody biomass saved due to implementation of improved cookstoves to be estimated using equation below:

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

Where,

B_{old}	=	Annual quantity of woody biomass that would have been used in the absence of the project activity (in tonnes per device) to generate useful thermal energy equivalent to that provided by the improved cook stove. The value of Bold can be sourced from

		historical data or baseline surveys. Alternatively, a default value of 0.5t/capita/year may be used.
η_{old}	=	Efficiency of baseline cookstove
$\eta_{new,i,j}$	=	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 Equation 4.

$$\eta_{new,y,i,j} = \eta_p \times (DF_n)^{y-1} \times 0.94 \quad \text{Equation (4)}$$

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 ofoperation (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.

Where the project households continue to use baseline cookstoves along with improved cookstoves, B_{old}shall be adjusted ex-post based on the percentage of project households found to continue such practice according to Equation 6. For such cases, the quantity of woody biomass saved $B_{y,saving}$due to implementation of improved cook stoves shall be calculated using an adjusted value to account for ex-post use of baseline stoves in addition to improved cookstove.

$$B_{old,adjusted} = B_{old} \times (1 - \mu_y) \quad \text{Equation (6)}$$

Where:

$B_{old,adjusted}$ = Adjust Bold to account the ex post usage of firewood in baseline cookstove(s) by project households in addition to improved cookstove (in tonnes per device)

μ_y = Baseline stove usage factor to account for use of baseline cookstoves along with improved cookstoves.

As per methodology quantity of firewood consumed in absence of project activity (Bold) shall be determined using a default value of 0.5 ton/capita/year. Household size shall be determined using credible references/literature or target population specific surveys.

In order to address the potential source of leakage which can be attributed to diversion of non- renewable biomass saved by project devices to non-project households which previously used renewable biomass; a net to gross adjustment factor of 0.95 is applied to $ER_{y,i,j}$.

The equations below shall be used for calculating biomass consumed in absence of project activity in case more than one project stove is used in household

$$B_{old,HH} = B_{old,p} \times N_{p,HH}$$

Where

$B_{old, HH}$ = Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices (tonnes/household/yea $N_{d, HH}$ = Number of project devices per household
$B_{old, p}$ = Annual quantity of woody biomass that would have been used per person in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices (tonnes/person/year) $N_{p, HH}$ = Average number of households

Determination of the Share of Non-Renewable Biomass:

As per para 49 of the methodology, the value of f_{NRB} can be calculated by using one of the two options as follows: (a) Conduct local studies to determine the local f_{NRB} value (sub national values) as per the "TOOL30: Calculation of the fraction of non-renewable biomass"[6]; or (b) Use default national values approved by the Board. The choice of which option to use shall be made ex ante.

As already prescribed under the point 10 of the applicability criteria of the methodology, the option (a) above has been adopted by PP to calculate f_{NRB} value.

Thus, according to methodological tool 30: "Calculation of the fraction of non--renewable biomass" version 03.0, shall be used to calculate f_{NRB}:

f_{NRB} = NRB / (NRB + RB)

Where,
NRB = Quantity of non-renewable biomass (t/yr) determined as per paragraphs 11 and 12 of the tool.
RB = Quantity of renewable biomass determined as per section 3.2 (t/yr) of the tool.

The parameters NRB & RB are also referred under the "Default f_{NRB} guideline" which is based on this particular Tool30. Calculated f_{NRB} value for India is 74%.

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)
2019 (From 28/06/2019 to 31/12/2019)	33,382	0	1669.08	31,712

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

2020	63,121	0	3156.03	59,964
2021	62,713	0	3135.67	59,577
2022	62,713	0	3135.67	59,577
2023	62,306	0	3115.31	59,190
2024	61,899	0	3094.94	58,803
2025	61,492	0	3074.58	58,417
2026	61,492	0	3074.58	58,417
2027	61,084	0	3054.22	58,030
2028	60,677	0	3033.86	57,643
2029 (From 01/01/2029 to 17/04/2029)	29,591	0	1479.53	28,111
Total	**620,469**	**0**	**31,023**	**589,441**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$B_{old,p}$
Data unit	Tonne/person/year
Description	Annual quantity of woody biomass that would have been used per person in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	Equation 3 VMR0006
Value applied:	0.5
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 emission reduction

Comments	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	$N_{p,HH}$
Data unit	No of persons/HH
Description	Average number of person per Household
Source of data	Latest National family Health Survey (NFHS-4) 2015-16 (https://dhsprogram.com/pubs/pdf/FR339/FR339.pdf) (Page 17)
Value applied:	4.6
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 emission reduction
Comments	This parameter shall remain fixed for the monitoring periods.

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	Fraction of non-renewable biomass is calculated as per the fNRB calculation TOOL30: Calculation of the fraction of non-renewable biomass version 3
Value applied:	74%
Justification of choice of data or description of measurement methods and procedures applied	Any changes/ revisions to this value would be monitored and if new default values are approved by the CDM EB the value of the fraction of NRB used will be updated.
Purpose of Data	Calculation of share of non-renewable biomass
Comments	This parameter shall remain fixed for the monitoring periods.

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	Emission reduction calculation
Comments	This parameter shall remain fixed for the monitoring periods.

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	Emission reduction calculations
Comments	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	$EF_{wf,non\ CO2}$
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	Emission reduction calculations
Comments	This parameter shall remain fixed for the monitoring periods.

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	The default value of 0.10 is used as the replaced system is a three stone fire, or a conventional device with no improved combustion air supply or flue gas ventilation, i.e. without a grate or a chimney.
Purpose of Data	Calculation of Quantity of woody biomass that is saved in tonnes per device
Comments	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	η_p
Data unit	Fraction
Description	Efficiency of the project stove at the start of project activity
Source of data	Manufacturer's specification
Value applied	0.3325
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 $\eta_{new,y,l,j}$

Comments	This parameter shall remain fixed for the monitoring periods.

5.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
Data unit	Number
Description	Number of project devices of type i and age a that are operating in year *y*
Source of data	Annual ICS users' survey
Description of measurement methods and procedures applied	Measured directly or based on a representative sample. Sampling standard shall 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.
Frequency of monitoring/recording	At least once every two years
Value applied:	25,520
Monitoring equipment	Annual user survey
QA/QC procedures applied	-
Purpose of data	Emission reduction calculation
Calculation method	If households are found continuing the use of traditional stoves, such households will be counted for having non-operational project device and equal proportion of households will not be counted towards emission reductions. Nevertheless, some households may retain their traditional stoves for religious reason where the traditional stoves are not used, the annual ICS users' survey will capture this information and it will be used accordingly while calculating the emission reductions.
Comments	

Data / Parameter	$\eta_{new,y,i,j}$
Data unit	Fraction

Description	Efficiency of the improved cookstove type i and batch j determined through water boiling test (WBT) during year y
Source of data	Calculation
Description of measurement methods and procedures applied	To adopt Option V given in the methodology: "Efficiency of the improved cookstoves to be estimated using equation 5 above where loss in efficiency per year is calculated, and therefore this parameter does not need to be monitored"
Frequency of monitoring/recording	Annual
Value applied:	Year 1: 33.25% Year 2: 30.94% Year 3: 30.63% Year 4: 30.33% Year 5: 30.02% Year 6: 29.72% Year 7: 29.43% Year 8: 29.13% Year 9: 28.84% Year 10: 28.55%
Monitoring equipment	-
QA/QC procedures applied	-
Purpose of data	Calculation of emission reductions
Calculation method	Calculation to be performed using equation below: $\eta_{new,y,i,j} = \eta_p \times (DF_n)^{y-1} \times 0.94$
Comments	

Data / Parameter	μ_y
Data unit	Fraction
Description	Adjustment to account for any continued use of pre-project devices during the year y
Source of data	Monitoring survey

Description of measurement methods and procedures applied	This parameter should be monitored using one of the following methods: If the baseline cookstoves are decommissioned and no longer used, as determined by the monitoring survey its value is 0 and B_{old}, adjusted is equal to B_{old}. If both the improved cookstove and baseline cookstoves are used together then surveys shall be conducted to record the average continued operation of baseline cookstoves in a sample of households. The surveys should be designed to capture the cooking habits and stove usage of households in the region, including quantification of use of baseline cookstoves, by formulating questions and/or collecting evidences to determine the frequency of usage of both the improved cookstoves and baseline cookstoves. For example, if there were 3 baseline cookstoves in a household and it was determined during the survey that use of one of them continues during the crediting period then a conservative adjustment factor of 0.33 is applied to Bold. Another example would be the case where there was only one baseline cookstove per household and its use during the project period continues along with the improved cookstove to meet 25% of the cooking needs of the household in which case the adjustment factor will be 0.25. Another example would be to interview the household and have them estimate the time of usage of the baseline cookstoves and improved cookstove on an average day.
Frequency of monitoring/recording	Once every 2 years
Value applied:	0
Monitoring equipment	-
QA/QC procedures applied	-
Purpose of data	Calculation of emission reductions
Calculation method	For Projects that opt for $\boldsymbol{B_{y=1,ew,i,j,survey}}$ i.e, direct measurement of biomass used in project stoves, then $\boldsymbol{\mu y}$ is not required to be computed.
Comments	

Data / Parameter	Life Span

Data unit	Number of years
Description	The operating lifetime of the project device. The life span should be reported if the methodology equation 5 is adopted to determine the project stove efficiency
Source of data	Manufacturer's specification
Description of measurement methods and procedures applied	-
Frequency of monitoring/recording	Once at the time of project stove installation
Value applied:	5
Monitoring equipment	-
QA/QC procedures applied	-
Purpose of data	Calculation of emission reductions
Calculation method	NA
Comments	*NA*

5.3 Monitoring Plan

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 Greentech Environment, India

Activities and performance related to emissions reduction are monitored by EGSPL. The PP proposed the following structure for data monitoring, collection, data archiving and calibration of equipments for this project activity instance. The team comprise will follow the below organizational structure.

The monitoring activities will involve data collection during distribution as well as usage information post distribution. The data collected during distribution will involve information about the stove, the purchaser and location to enable one to uniquely identify each ICS unit and avoid double counting. This will form what is called the sales record. Greentech Environment will distribute the stoves, as well as carry out the monitoring activities that occur during the distribution of stoves. Greentech Environment or through their associates will ensure that the distributor is trained on how to capture the sales data. The project activity implementer is fully responsible to ensure the correct distribution process and data gathering is followed. In turn, the distributing agent will link remuneration to the complete and accurate collecting of information during the distribution of stoves.

The following information will be recorded at the time of distribution of ICS to the user:

- Name of the User
- Total Family Members
- District
- Tehsil/village
- Date of distribution
- Unique ID

However, during post distribution, monitoring activities will involve selecting a sample of stove from the sales record and visiting the premises where these stoves are located to monitor key parameters pertinent in ER Calculation.

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
Enen Green	✓ VCS documentation development ✓ Communicate with VERRA for all VCS related matters ✓ Communicate with DOEs for validation & verification ✓ Engage consultant or any entity for CDM process (if required) ✓ Identify local partners for local representation and support ✓ Identity suitable ICS manufacturers (both local & for import) ✓ Design the distribution plan for on ground implementation of ICS ✓ Design the monitoring system (including data collection using digital tool &too collate 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
Greentech Environment(**Local Representative**)	✓ To support & assist Enen Green in achieving the stated goal of the project activity ✓ Assist and facilitate Enen Green in baseline data collection, efficiency testing, etc. ✓ To be the local representative and communicate, act and engage in 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 Enen Green during training of the Operational Team and capacity building across the end users. ✓ To bridge any gap in between end users of ICS and Enen Green in order to ensure smooth operation of the program to achieve overall objective of the project activity
Operational Team	The operational team(s) would consist of different members depending on the requirement at the time of dissemination of the ICS. A proposed team composition would be as follows:

	✓ **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 Greentech Environment team on the installation (delivery), uses, handling etc. of the ICS at households.

Sampling Plan

As per the Guideline for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 04.0, the sampling plan is the following:

(a) Sampling design

Due to the large number of ICS envisioned to be distributed under the project, it is not economically feasible to monitor each individual ICS unit distributed. Therefore, representative sampling shall be undertaken for each batch of ICS. The sampling plan to be designed in line with the requirements of the Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 08.0. Samples will be drawn from ICS recorded in the project database administered by the project proponent. A detailed explanation of this database is found in Section 1.11 of project description. Objectives and Reliability Requirements The objective is to obtain an unbiased and reliable estimate of the proportion or mean value of the following key variables over the course of the crediting period. As per methodology, 90/10 confidence/precision shall be applied for annual sampling requirement and 95/10 for biennial sampling inspection. As per Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, 90/10 confidence/precision to be adopted for small-scale project and 95/10 for large-scale project. Given that the size of the project is under the category of small scale projects, hence 90/10 confidence/precision shall be adopted for all parameters unless the average annual emission reductions of the project below the threshold

Monitored Parameters:

The project involves introduction of improved cook stoves as energy efficiency measure:

Sr. No.	Monitoring Parameters	Sampling Parameters	Parameter type	Monitoring frequency
1	Ny,i,j Number of project devices of type i and batch j operating during year y	Proportion of ICS still in operation	Proportion	Biannually
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	Daily consumption of woody biomass per ICS	Proportion	Determined in the first year of project implementation

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 heterogeneous in nature i.e. common technology with similar operating

characteristics but dispersed i.e. distribution of ICS is spread across 3 district of state Assam. The population consists of sub-populations which are homogeneous called as Strata. The characteristics of population (for example quantity of biomass consumed) are more similar within the stratum (ICS of same type, vintage and project area in which they are operating) than across the strata. Therefore, Stratified Sampling technique will be used to conduct sampling survey among ICS batches. The populations of each batch will be combined together, the sample size is determined, and a single survey will be undertaken to collect data. To ensure the survey result is representative of the entire population, the dissimilarity (such as ICS type, vintage and project area in which they are operating) within the included CPAs will be taken into account in the sample size calculation. The ICS of same type, vintage and project area 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):

$\boldsymbol{Ny,i,j}$ = 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)

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

Sample Size

The procedure to determine the sample of households will ensure that they adequately represent the broader project population, minimizing sampling error. Using, a 90 per cent confidence level, and a 10 per cent margin of error, a random sample will be selected from each strata. In order to calculate the required sample size estimates, values for the proportions, mean values, and standard deviations are required. As per Guideline for Sampling and surveys for CDM project activities and programmes of activities, version 04.0, there are different ways available to obtain the estimates of the parameter of interest:

(a) Refer to the result of previous studies and use these results;

(b) In a situation where information from previous studies is not available, a preliminary sample as a pilot could be conducted and use that sample is used to provide the estimates;

(c) Use best guesses based on the researcher's own experiences.

Proportion parameter To estimate the sample size for proportion parameters, the following equation is used:

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

Where:

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

n	=	Sample size
N	=	Population size (Total number of households or ICS)
P	=	Weighted overall expected proportion
SD^2	=	Weighted overall expected variance
1.645	=	Represents the 90% confidence required
0.1	=	Represents the 10% relative precision

Sample Size calculation

Proportion parameter To estimate the sample size for proportion parameters, the following equation is used:

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

Where:

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

n = Sample size
N = Population size (Total number of households or ICS)
P = Weighted overall expected proportion
SD^2 = Weighted overall expected variance
1.645 = Represents the 90% confidence required
0.1 = Represents the 10% relative precision

District	No of cookstove device distributed	Proportion of cookstove in operational
Baksa	7435	0.78
Udalgiri	9980	0.59
Barpeta	8105	0.71

$$SD^2 = \frac{7435X0.78X(1-0.78) + 9980X0.59X(1-0.59) + 8105X0.71X(1-0.71)}{25520}$$

$$SD^2 = 0.2099$$

$$\bar{P} = \frac{7435X0.78 + 9980X0.59 + 8105X0.71}{25520}$$

$$\bar{P} = 0.68$$

$$V = \frac{0.2099}{0.68^2}$$

$$V = 0.45$$

$$n \geq \frac{1.645^2 X25520X0.45}{(25520-1)X0.1^2 + 1.645^2 X0.45}$$

$$\geq \frac{31075.99}{255.19 + 1.2177}$$

$$n \geq 121.19 \approx 122$$

Sample size per district

Baksa = $\frac{7435}{25520} X\ 122 = 35.54 \approx 36$

Udalgiri = $\frac{9980}{25520} X\ 122 = 47.71 \approx 48$

Barpeta = $\frac{8105}{25520} X\ 122 = 38.75 \approx 3$

As the project is planned to implement around 25,520 stoves in Baksa, Udalguri and Barpeta district of Assam state in India, a sample survey of 130 households has been collected whereas required sample was 123. During survey surveyor has checked ICS unique id, name of beneficiary, installation date, usage of any traditional cookstove, quantity of fuel use per month, operational status of ICS etc (detailed questionnaire can refer in monitoring survey report issued by third party). The data collections were

performed by a field team in July 2020 in between 1st July to 15th July, the survey households were chosen from the potential ICS beneficiaries using Stratified random sampling approach.

S. No.	Districts	Number of Households Surveyed
1	Baksa	40
2	Udalgiri	50
3	Barpeta	40

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 age a that are operating in year *y*
Value applied:	17,379
Comments	During the current monitoring period as per ICS survey 123 samples were collected.Baksa district – 36 samples, Udalgiri district – 48 samples Barpeta district –39 samples.

Data / Parameter	$\eta_{new,i,j}$
Data unit	Fraction
Description	Efficiency of the device of type i being deployed as part of the project activity.
Value applied:	33.25 %
Comments	If any sample stove is found to be operating below the 20% efficiency, the proportionate number of stoves will be considered non-operational and not accounted for ER calculation.

Data / Parameter	μ_y
Data unit	Fraction
Description	Adjustment to account for any continued use of pre-project devices during the year y
Value applied:	0
Comments	In sampling survey no baseline cookstove found at user therefore value applied is and Bold, adjusted is equal to Bold.

Data / Parameter	Life Span
Data unit	Years
Description	Project promoters to state the operating lifetime of project device for projects
Value applied:	5
Comments	Manufacturer's specification

6.2 Baseline Emissions

The methodology does not account for baseline emissions separately, but instead quantifies emission reductions as a function of the reduction in the amount of non-renewable biomass fuel consumption in the efficient project stoves as compared to baseline stoves.

6.3 Project Emissions

The methodology does not account for project emissions separately, but instead quantifies emission reductions as a function of the reduction in the amount of non-renewable biomass fuel consumption in the efficient project stoves as compared to baseline stoves.

6.4 Leakage

Leakage shall be considered as default 0.95 in accordance with Section 5.4 of AMS-II.G

6.5 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.

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

Where:
i = Indices for the situation where more than one type/model of improved cookstove is introduced to replace there 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 tCO_2e
ERy,i,j, = Emission reductions by improved cookstove of type *i and* batch *j* during year *y* in tCO_2e

$$ER_{y,i,j} = B_{y,savings,i,j} \times NCV_{wood\ fuel} \times f_{NRB,y} \times \left(EF_{wf,CO2} + EF_{wf,non\ CO2}\right) \times N_{y,i,j} \times 0.95 \qquad \text{Equation (2)}$$

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved in tonnes per improved cookstove of type i and batch j during year y
$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass (f_{NRB})
$NCV_{wood\ fuel}$	=	Net calorific value of the non-renewable woody biomass that is substituted or reduced(IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
$EF_{wf,CO2}$	=	CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO2/TJ)
$EF_{wf,non\ CO2}$	=	Non-CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO2/TJ)
$N_{y,i,j}$	=	Number of improved cookstoves of type i and batch j operating during year y
0.95	=	Discount factor to account for leakage

Determination of $B_{y,savings,i,j}$

The quantify of woody biomass saved due to implementation of improved cookstoves to be estimated using equation below:

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

Where,

B_{old}	=	Annual quantity of woody biomass that would have been used in the absence of the project activity (in tonnes per device) to generate useful thermal energy equivalent to that provided by the improved cook stove. The value of Bold can be sourced from historical data or baseline surveys. Alternatively, a default value of 0.5t/capita/year may be used.
η_{old}	=	Efficiency of baseline cookstove
$\eta_{new,i,j}$	=	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 Equation 4.

$$\eta_{new,y,i,j} = \eta_p \times (DF_n)^{y-1} \times 0.94$$ Equation (4)

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.

As per survey result $\mu = 0$ therefore $B_{old\ adjusted} = B_{old}$

$$B_{old,adjusted} = B_{old} \times (1 - \mu_y)$$ Equation (6)

Where:

$B_{old,adjusted}$ = Adjust Bold to account the ex post usage of firewood in baseline cookstove(s) by project households in addition to improved cookstove (in tonnes per device)

μ_y = Baseline stove usage factor to account for use of baseline cookstoves along with improved cookstoves.

In accordance with AMS.II-G version 11.1 paragraph 23, It is assumed that in the absence of the project activity, the baseline scenario would be the projected use of fossil fuels to meet similar thermal energy needs as those provided by the project devices. The actual baseline scenario is the use of NRB. Since NRB has higher carbon intensity than the fossil fuels proposed in AMS II.G, this assumption reduces the emission reductions significantly, making the outcome more conservative. The detailed calculations are provided in section 4.4 of the VCS PD.

Period	No of days	Estimated emission reduction (tCO2e)	Actual Emission Reduction considering leakage (tCO2e)
28th June 2019 - 31st Dec 2019	187	31,496.9	12,767
1st Jan 2020 – 27th June 2020	179	30,149.5	20,672
Total		**61,646.4**	**33,439**

Actual achieved emission reduction is 45.76% lower than estimated emission reduction.

Total emission reduction for period 28th June 2019 to 27th June 2020is 33,439 tCO_2e.

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2019 (28th June 2019 - 31st Dec 2019)	12,767	0	12,767
2020 (1st Jan 2020 – 27th June 2020)	20,672	0	20,672
Total	**33,439**	**0**	**33,439**

APPENDIX 1: STAKEHOLDER CONSULTATION INVITATION& PHOTOS

Gmail **Avinash Sharma <as@enengspl.com>**

Stakeholder Invitation

Ruchika Sharma <ed@enengspl.com> 21 October 2020 at 11:47
To: Enen Green <enengreen@gmail.com>
Cc: Green tech <ge@enengspl.com>

Stakeholder Invitation

Dear Stakeholders,

Greetings!

Greentech Environment and Enen Green Services Private limited are pleased to invite you to participate in the Stakeholder Consultation to provide your feedback on the Energy Efficient Cook Stove Implementation in India (VERRA pipeline id 2336). This project will be developed as a VERRA Standard project.

The project activity involves promotion of improved cooking stoves (ICS) to the people of socially deprived community in India. The project intends to avail the households with clean cooking solutions; thereby, displacing the less efficient traditional cooking stoves from the kitchen with stoves of better efficiency. Replacement of the traditional cooking stoves with ICS will reduce the exposure of the family members, specifically women, to the indoor air pollution and therefore result in saving of health related expenses.

The estimated annual emission reductions over a 10 year period of first crediting period are 35,472 tCO_2e/year. The total emission reductions for 10 years crediting period will be 354,719 tCO_2e. Total GHG emission reduction in first monitoring period 18th April 2019 to 31st March 2020 is 33,916 tCO_2e.

Please refer the attached project design document (PDD) of the VERRA Standard. We would be really happy to receive your feedback on the same. Please join us in stakeholder consultation at below venue and time.

Venue: Jalaram Mandir, Fatasil Ambari, Guwahati, Assam

Time: 4.00 PM on 28 Oct 2020

Sincerely,

For **Enen Green Services Pvt. Ltd. and Greentech Environment**

Regards,
Ruchika,
Director,
Enen Green Services Pvt. Ltd.

VCS PD_MR_2336_India Cookstove.pdf
783K


Green tech
Stake-Holders meeting