DISTRIBUTION OF IMPROVED COOK STOVE - PHASE 8

Document Prepared by EKI Energy Services Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project activity (usage of improved cook stoves) has been deployed to facilitate clean cooking practice and reduce health risk due to indoor air pollution[1] along with reduction of drudgery amongst the tribal households (Schedule Tribe) and families living below the poverty level (BPL category[2]) across Sindhudurg , Ratnagiri and Kolhapur District in Maharashtra. The usage of improved cook stoves through replacement of inefficient traditional cook stove contributes towards reduction of greenhouse gas emission, reduction of by-products of incomplete combustion like black carbon and conservation of fuel wood resulting in prevention of forest degradation. The higher efficient portable, single pot improved cook stoves distributed under the project activity has changed the prevailing practice of usage of traditional cook stoves across selected households in rural areas across Sindhudurg, Ratnagiri and Kolhapur district in Maharashtra.

It is worthwhile to note that firewood and wood chips contributes as major cooking fuel amongst rural households in India. According to the NSSO[3] 61st round survey, a considerable percentage of rural population of Maharashtra relies upon fire wood for cooking and the percentage is substantially much higher amongst the lower MPCE (Monthly Per Capita Expenditure) group. Since, the beneficiary selected under the project belongs to BPL and ST category of population in terms of capacity of expenditure therefore; improved cook stove use results in substantial fuel wood saving as this section is the major consumer of fuel wood.

The improved cook stoves distributed under the project activity are more efficient with thermal efficiency of 29.88%[4] as compared to traditional stoves with thermal efficiency of around 10%[5]. Owing to higher efficiency, use of efficient improved cook stove results in reduced consumption of non-renewable biomass in compared to baseline by minimizing thermal energy losses and facilitating complete combustion. Reduced consumption/ combustion of non-renewable biomass results in reduction of GHG emission.

Technology Employed

The cook stove deployed under the project activity[6] is single pot, portable, metallic, improved biomass cook stoves[7] made of cast iron for combustion of solid biomass. The improved cook stoves are manufactured in accordance to IS 13152, Part-1: 1991, CPRI Design Type I[8] standard. The design ensures complete combustion of biomass. The cook stove is tested

[1] Household Cook stoves, Environment, Health and Climate Change – World Bank (Executive summary, page 9-11)

[2] As per the article in The Hindu (http://www.thehindu.com/news/national/article3013870.ece) dated March 20, 2012 anyone with daily consumption expenditure below Rs. 22.42 is categorised under BPL. The article depicts of 24.5% of the total population in Maharashtra under BPL in 2009-10.

[3] National Sample Survey Office

[4] Thermal Efficiency Test Report of Improved Cook stove tested at Biomass Cook stove Testing Centre, Dept. of Renewable Energy Sources, Udaipur

[5] Paragraph 6 (Option 2) of approved applicable methodology AMS –II.G., Version 03

6 Manufactured by Vikram Stoves and Fabricators (Ministry of New and Renewable Energy) approved manufacturer and distributor of improved cook stoves) selected by RDWC Department, Government of Maharashtra for distribution of improved cook stoves amongst identified beneficiaries.

7 MNRE accredited system -http://mnre.gov.in/schemes/decentralized-systems/national-biomass-cookstoves- initiative/

8 The design of the cook stove is certified by Bureau of Indian Standards relating to its appropriateness to, IS 13152 (Part1).

for thermal efficiency (29.88%) as per water boiling test protocol specified in IS 13152, Part 1: 1991.

Measures undertaken

The Rural Development and Water Conservation (RDWC) Department, Government of Maharashtra is involved in promoting betterment of living standard for the tribal household (ST) and families living Below Poverty Line (BPL) in villages of Maharashtra. The department as a part of its aforesaid programme selects households from amongst the ST and BPL category depending upon level of vulnerability (assessed on basis of 13 parameters: Category and size of usable land, Type of house, Availability of regular usable clothes, Protection of food or food security, Cleanliness, Ownership of required goods, Heights /Level of literacy, Family working capacity, Source of livelihood goods, Number of children in age group (5 to 14), Type of bankruptcy, reason for staying away from family of Earning member, Choice of help /Yojana)[9] and provide financial assistance to facilitate better and hygienic living standard. The household selected for financial assistance under the programme is provided with an improved cook stove system. The household considered as end users of cook stoves under the project activity are poor enough to afford for procurement of improved cook stoves and are also least interested towards similar investment as wood is available for free. So, in absence of the improved cook stove disseminated under the project activity the household would have continued with use of traditional cook stoves. Since, the project activity is conceived under the program of Govt. of Maharashtra which provides cook stove only to BPL and ST category household so; there is no chance of cook stove to be distributed to non-baseline household. The identification of beneficiaries and distribution of cook stoves comes under the preview of the Rural Development and Water Conservation Department.

The project activity includes dissemination of 14,046 Nos. improved cook stoves[10] amongst Below Poverty Line (BPL) and Scheduled Tribes (ST) households in rural areas of Sindhudurg and Ratnagiri districts of Konkan Division and Kolhapur district of Pune Division in Maharashtra upon signing of the end user Tripartite Agreement[11]. The project through conservation of non-renewable biomass was estimated to result in an greenhouse gas emission reduction of 12,627 tCO_2e annually (ex-ante). The revenue from carbon financing was conceived in deciding upon the capital cost as well as to meet up the cost towards imparting awareness and training, periodic maintenance[12] and post lifetime replacement within the crediting period.

The amount of emission reductions achieved for the current monitoring period is 59,479 tCO_2e.

The start date of the project activity is 01-November-2012. Since the project activity of improved cook stove usage by the end user does not require any construction or significant pre-project implementation, nor financial commitment on the part of end user therefore the real action pertaining to the earliest date of distribution of improved cook stoves under the project activity is considered as the start date as per project start date definition of section 3.7 of the VCS Standard V.4.1.

9 Criteria issued by Department of rural Development, Government of Maharashtra

10 Each of the cook stoves is included for the purpose of emission reduction calculation from the day on which it is distributed to the beneficiary and the end user agreement is signed.

11 Tripartite Agreement is for transfer the emission reduction right to the Project Participant by each beneficiaries/end users and is signed amongst end user, GKEMPL and Vikram Stoves. The tripartite agreement authorizes M/s G K Energy Marketers Pvt. Ltd (hereafter referred to as GKEMPL) by Vikram Stoves (manufacturer of improved cook stoves) and the end users for securing of carbon finance

12 "The Indian stove programme: an insider's view – the role of society, politics, economics and education" by Bhaskar Sinha, National Institute of Science, Technology & Development Studies (NISTADS), CSIR, New Delhi outlines that the woman are least interested for maintenance as they do not perceive the usefulness of the stove and revert back to traditional practice when the cook stove becomes non-functional therefore timely operation and maintenance are vital.

1.2 Sectoral Scope and Project Type

- Sectoral Scope: 3- Energy demand
- Project Type: Type II

The project activity fulfills the applicability criteria of small- scale project activity, Type II – Energy Efficiency Improvement Projects, Category G –'Energy efficiency measures in thermal applications of non-renewable biomass' of the 'Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-scale Project Activity Categories'.

This is non-AFLOU type of project

1.3 Project Proponent

Organization name	M/s G K Energy Marketers Pvt. Ltd
Contact person	Mr. Gopal Kabra
Title	Authorized Signatory
Address	Lokmanya Nagar, LBS Road, Flat No.- 350, Building No.- 25,Ground Floor, Pune, Maharashtra – 411030 India
Telephone	+91-997045
Email	gopal@energymarketers.in

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Mr. Pankaj Rajpoot
Title	Assistant Manager- Operations
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91- 7828347589
Email	registry@enkingint.org

1.5 Project Start Date

The start date of the project activity is 01-November-2012.

The project activity relating to improved cook stove usage by the end user does not require any construction or significant pre-project implementation, nor financial commitment on the part of end user. The real action pertaining to the earliest date of handover of improved cook stoves to beneficiary (also considered as date of onset of GHG emission reductions) under the project activity is considered as the start date as per project start date definition under paragraph 3.7 of the VCS Standard.

The distribution was initiated once all the Improved cookstoves (disseminated under the project activity) were supplied to the office of the concerned line department by the manufacturer and the project proponent has completed signing of tripartite agreement with selected beneficiaries.

The date of supply/ receipt of first lot of improved cookstoves from manufacturer to the regional office of the line department was considered as start date under the CDM registered PDD (evidenced through acknowledgement of the delivery receipt of the line department) as per CDM definition of Start Date. The start date referred to in the registered CDM-PDD was mirrored in the VCS PD. Since the date does not resembles to handover of the cookstoves to beneficiary and does not result in onset of actual emission reduction therefore the same was not considered as start date under VCS mechanism and therefore revised with date of distribution/ handover of improved cookstoves to beneficiary.

1.6 Project Crediting Period

The crediting period of the project activity is for 10 years (Fixed).

The length of the first crediting period is 01-November-2012 to 31-October-2022 (both dates inclusive).

As per errata and clarification, a project is deemed to have met the timelines where Verra confirmed (in writing, to the project proponent or an authorized representative) the project's eligibility on or before 4-February-2021.The listing process has been completed before 04-February-2021 and hence the errata and clarifications are not applicable

1.7 Project Location

The project is located in state Maharashtra, India.
The list of division is given below:
Division: Konkan
Districts: Sindhudurg and Ratnagiri
Division: Pune
Districts: Kolhapur

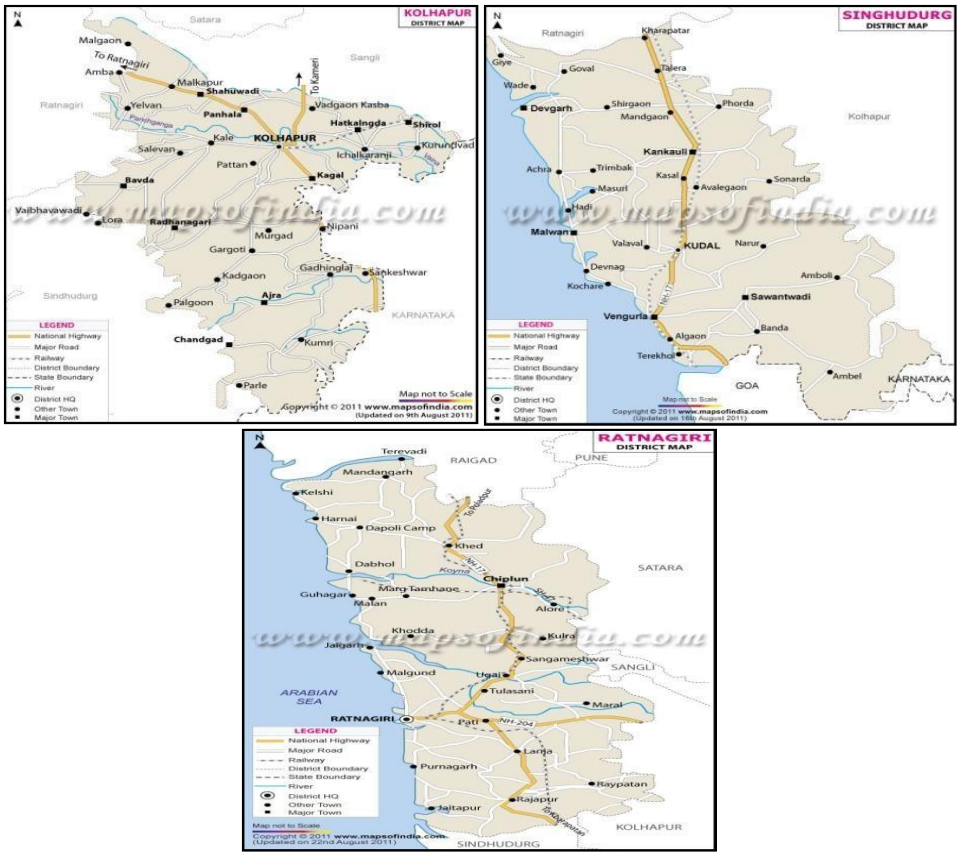
Division	District	Latitude	Longitude
Pune	Kolhapur[13]	15.00 - 17.00^{0}N	73.00 - 74.00^{0}E
Konkan	Sindhudurg[14]	15.37 – 16.40^{0}N	73.19 – 74.18^{0}E
	Ratnagiri[15]	16.30 – 18.00^{0}N	73.00 – 74.00^{0}E

Map of India[16]

[13] Ref: http://kolhapur.nic.in/new/DistrictGazetteer/phy_situation.html accessed on 30/11/2012
[14] Ref: http://sindhudurg.nic.in/Frames/English/historyculture.html accessed on 30/11/2012
[15] Ref: http://dcmsme.gov.in/publications/traderep/ratnagiri.htm accessed on 30/11/2012
[16] Ref: http://www.mapsofindia.com/maps/india/india-political-map.htm - accessed on 310/11/2012

Maps of Maharashtra[17]

[17] http://www.mapsofindia.com/maps/maharashtra/maharashtra.htm accessed on 10/11/2012



Maps of Kolhapur[18], Sindhudurg[19] and Ratnagiri[20]

District wise list of Village included in the table below:

District	Kolhapur ,
Taluka	Karvir

Sr.	Name of the village	Taluka
1	Adur	Karvir
2	Amashi	Karvir
3	Ambewadi	Karvir
4	Arale	Karvir
5	Ardewadi	Karvir
6	Are	Karvir
7	Bachani	Karvir
8	Bahireshwar.	Karvir
9	Balinge	Karvir
10	Beed	Karvir
11	Bele	Karvir
12	Bhamate	Karvir

[18] http://www.mapsofindia.com/maps/maharashtra/districts/kolhapur.htm accessed on 30/11/2012

[19] http://www.mapsofindia.com/maps/maharashtra/districts/sindhudurg.htm accessed on 30/11/2012

[20] http://www.mapsofindia.com/maps/maharashtra/districts/ratnagiri.htm accessed on 30/11/2012

Sr.	Name of the village	Taluka
13	Bhatanwadi	Karvir
14	Bhuye	Karvir
15	Bhuyewadi	Karvir

District	Sindhudurg
Taluka	Kudal

Sr.	Name of the village	Taluka
1	Akeri	Kudal
2	Ambadpal	Kudal
3	Amberi	Kudal
4	Ambrad	Kudal
5	Anav	Kudal
6	Andurle	Kudal
7	Anjivade	Kudal
8	Avalegaon	Kudal
9	Bambarde Tarf Kalsuli	Kudal
10	Bambarde Tarf Mangaon	Kudal
11	Bambuli Tarf Haveli	Kudal
12	Bav	Kudal
13	Belnadi	Kudal
14	Bengaon	Kudal
15	Bhadgaon Bk.	Kudal
16	Bhadgaon Kh.	Kudal
17	Bharani	Kudal
18	Bhattgaon	Kudal
19	Bhutvad	Kudal
20	Bibavane	Kudal
21	Borbhat	Kudal
22	Chafeli	Kudal
23	Chendawan	Kudal
24	Deulwadi	Kudal
25	Dholkarwadi	Kudal
26	Digas	Kudal

District	Ratnagiri
Taluka	Ratnagiri

Sr.	Name of the village	Taluka
1	Adi	Ratnagiri
2	Agarnaral	Ratnagiri
3	Agave	Ratnagiri
4	Ambekarwadi	Ratnagiri
5	Ambeshet	Ratnagiri
6	Are	Ratnagiri

7	Bagpatole	Ratnagiri
8	Bajarpeth	Ratnagiri
9	Basani	Ratnagiri
10	Bhagavatinagar	Ratnagiri
11	Bhandarpule	Ratnagiri
12	Bhandarwada	Ratnagiri
13	Bhandarwada	Ratnagiri
14	Bhandarwadi	Ratnagiri
15	Bhatye	Ratnagiri
16	Bhave Adom	Ratnagiri
17	Bhoke	Ratnagiri
18	Bholewadi	Ratnagiri
19	Bondye	Ratnagiri
20	Chafe	Ratnagiri
21	Chanderai	Ratnagiri
22	Chandor	Ratnagiri
23	Chaperi	Ratnagiri
24	Charveli	Ratnagiri
25	Chave	Ratnagiri
26	Chidravali	Ratnagiri
27	Chikhalwadi	Ratnagiri
28	Chinchkhari	Ratnagiri
29	Dabhil Ambere	Ratnagiri
30	Dande Adom	Ratnagiri
31	Dangewadi	Ratnagiri
32	Dewood	Ratnagiri
33	Dhamanse	Ratnagiri
34	Dhanawade Wadi	Ratnagiri
35	Dhokambale	Ratnagiri
36	Dhopatwadi	Ratnagiri

1.8 Title and Reference of Methodology

Consolidated baseline methodology for “Energy efficiency measures in thermal applications of non-renewable biomass”; AMS II-G, Version 03.0.0 Sectoral Scope: 03, EB 60.

1.9 Participation under other GHG Programs

Project has been registered with UNFCCC under Clean Development Mechanism program, Registration reference number is 8746.

The Project is not rejected by any other GHG programs.

1.10 Other Forms of Credit

India is non-annex1 country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is registered under CDM with registration ID 8746. Project Proponent has submitted undertaking that they will not claim same GHG emission reductions of the project from CDM and VCS. Project

Proponent would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions. Project Proponent has also submitted an undertaking stating that they will not take REC benefits for the same Emission Reductions.

Project Proponent has submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration. Project Participant is not taking REC benefits for the same emission reductions.

1.11 Sustainable Development

The project contribution towards sustainable development is established in line with the sustainable development indicator framed by the host country DNA:

Social benefits:

1. Reduces drudgery of women and children of rural areas (due to reduced fuel wood use) by reducing time spent and distance travelled for fuel wood collection. Reduction in firewood requirement helps in spending more time in productive activities such as education, employment etc.
2. Improves overall health (particularly diseases related to respiratory system) of women and children by reducing smoke in the kitchen.

Environmental benefits:

1. Improves the local environment by reducing rate of forest degradation /deforestation in the project area. Conservation of forest is not only reduce non-renewable biomass demand and also reduce soil erosion and loss of biodiversity as a consequence of deforestation.
2. Reduces emission of black carbon to the atmosphere.
3. Reduces Green-house gas emissions.

Economic benefits:

1. Employment opportunities for local communities involved in monitoring, training of users, undertaking periodic maintenance and post life time replacement.
2. Reduces the expenditure involved in the pre project scenario for purchase of fuel wood.

Technological benefits:

1. Introduction of new technology to the rural communities.
2. Knowledge transfer to trainers including technicians for pertaining training to users, maintenance of system.
3. Demonstration of a successful project at household level creates replication potential in other states and countries.

In view of the above, the project proponent considers that, the project activity profoundly contributes towards sustainable development of the region as well as of the nation.

2 SAFEGUARDS

2.1 No Net Harm

According to the Ministry of Environment and Forests (MoEF), Government of India, under the Environment Impact Assessment Notification vide S .O.1533(E), dated 14-September-2006; the project activity of utilization of Improved Cook stove for cooking in rural households does not require environmental impact assessment study to be carried out.

2.2 Local Stakeholder Consultation

The project proponent has opted to develop CDM project for distribution of cook stoves in and across the different location in the state across different time frame. Based on the number of cook stoves aimed to be distributed under the planned program 30 phases are planned. Since the household to be covered in each phase are homogeneous owing to the household being identified by the Rural Development Department, Government of Maharashtra based on the level of poverty judged on the basis of the thirteen point criteria figured out by the Ministry and the total budgetary provision across the year. Because of the limited budgetary provision across a financial year a fixed number of populations can only be covered amongst the group leaving the others to be covered in subsequent time frame. Because of the similar category of population, the project proponent decided to carry out the stake holder's consultation for all the planned phases in a single go, so that the people from different geographical locations could able to respond to such meeting. The location for the consultation program is so selected that the particular location of the consultation represents the particular division or region of Maharashtra under whose jurisdiction several districts come into. As such the locations for the consultation program are selected and newspaper advertisements are published both in English and regional daily about the program so that the peoples from the particular region can attend the consultation program which they feel nearby. Local stakeholders' meetings were conducted to take public comments. Six stakeholder meetings were conducted at Nasik, Pune, Nagpur, Latur, Sangli and Washim districts of Maharashtra. The details of meetings are –

Date of Meeting	District	Meeting Venue
2nd February 2012	Nasik	Siaram Indrayani Housing Society, Takli Rd, Nasik– 06
2nd February 2012	Pune	G K Energy Marketers Pvt Ltd. Lokmanya Nagar, LBS Rd, Pune
2nd February 2012	Nagpur	246 KumbarPura, Jagnath Rd Gandhi Bag, Nagpur
2nd February 2012	Latur	Sut Mil Rd, Pushkar Residency, Latur
3rd February 2012	Sangli	Khan Bag, Jai Bhavani Chowk, Sangli
3rd February 2012	Washim	Dr. Jirvankar Bhar Jahangir Resod, Washim

Along with public notices published in newspapers namely The Free Press Journal, Mumbai and Navshakti, Mumbai on 26th January 2012, notification of the meetings was sent through invitations, letters and personally to various categories of stakeholders to attend the stakeholder meeting. The meeting was conducted in regional language –Marathi and English. The discussion points of the meeting included purpose of the consultation, background and role of bundling agency and manufacturer under this project, description of the project, demonstration of improved cook stove, about climate change and CDM, impact of climate change, global environment scenario, contribution of the project towards sustainable development of the country by the representative from bundling agency and Improved Cook stove manufacturer. After a detailed elaborative discussion on the project, the stakeholders

were asked to provide their comments /feedbacks /suggestions on the project. The cook stoves in this project activity (Eighth Phase) are distributed in Sindhudurg and Ratnagiri districts of Maharashtra which lies in Konkan division and Kolhapur District of Maharashtra which lies in Pune division jurisdictions respectively. The stakeholder's consultation was conducted on 2nd February 2012 at Pune and on 3rd Febrarury 2012 at Sangli. Since Sangli is adjacent district of Sindhudurg and Ratnagiri (as the Headquarters of Konkan division is Mumbai - an Urban Centre) and Pune is the divisional headquarters of Kolhapur and therefore it can be concluded that the areas of the project activity is covered for the purpose of the stakeholders consultation. The consultations were also conducted before the webhosting of the PDD.

The meetings were attended by members from various backgrounds as listed below –

Participant of Pune Meeting

Sl. No.	Name of Person	Designation
1	Baviskar Chandrakant Namdeo	Sr. Operator
2	Jitesh M Gavade	Executive
3	Phatak Revati Vishwajit	Office Assistant
4	Vishwajit V Phatak	Sr. Engineer
5	Amit Namdev Davre	Farmer
6	Sachin Aadagle	Executive
7	Vijay Budwale	Executive
8	Akash Rajpurohit	Sales Executive
9	Sunny Chandane	Worker
10	Abhijit Londhe	Farmer
11	Sagar Londhe	Business
12	Sandeep Randive	S/w Technique
13	Avinash Subash Jadav	Sales Executive
14	Dhavre Suhas Shivaji	Worker
15	Gautam Dhani Binge	Plumber
16	Dilip Shah	HR Manager
17	Gunaji Adagale	Farmer
18	Roshan Patel	Business
19	Jadhav Avinash Subhash	Student
20	B Rupesh Dalvi	Farmer
21	Shankar Patil	Worker
22	Pankaj Baviskar	CTO, GKEMPL

Participant of Pune Meeting

Sl. No.	Name of Person	Designation
1	Gulab Dagadu Sitape	Working Professional
2	Shivraj Murlidhar Sathe	Working Professional
3	Navnath Govind Ghodke	Worker
4	Kodiba Sopan Shirmali	Worker
5	Ranav Jyotiram Kanekore	Worker
6	Shewale Mahadev Sadashiv	Education
7	Suraj Kashinath Naravre	Student
8	Balaji Vakonde	Local representative

9	Alere Samdhan Bhagirath	Working Professional
10	Prakash Vilas Jadhav	Local representative
11	Anjali Giri	House-wife
12	Rupali Naliram Deshpande	House-wife
13	Viajinath Vishwanath Kamble	Local representative
14	Gayake Ashok Gyanba	Student
15	Shakruta Govind Kumbhar	Worker
16	Savita Tukaram Yadav	House-wife
17	Shobha B Kamble	House-wife
18	Rina Vanraj Bansode	Worker
19	Sunil Yenale	Marketing Executive, Vikram Stoves

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.
The stakeholder's comments sought during the meeting in following manners –

- The stakeholders were invited to ask any clarification or information on the project activity during the meeting.
- Evaluation form / questionnaire were asked to fill in by the stakeholders interested to give their inputs on the project activity.

The evaluation forms were analyzed for the comments and no negative comments is being found.

The summary of stakeholder's comment received during stakeholders meeting are summarized as below –

Queries	**Reply**
How the project is contributing in pollution reduction?	The representative from GKEMPL explained that, project is reducing fire-wood consumption through improved combustion technology and thereby reducing green-house gases emission and also reducing smoke generation.
What is the tentative timeline for CDM project development?	Responding to the query, Mr. Baviskar mentioned that, time line for CDM project development and registration is around one year but, the revenue inflow will take at least another one year.
What is the process of estimation of Green-house gas emission reduction?	In response to this, Mr. Baviskar explained the procedure of Green-house gas emission reduction calculation in brief.
Comment	Mr. Phatak, Engineer emphasized that, it is a very good initiative taken by GKEMPL and Vikram Stoves and this will help to achieve the objective of the Govt. of Maharashtra and Govt. of India. Hence, everyone should encourage and implement such type of projects to keep the environment good.

Queries	**Reply**

Clarification on process of estimation of Green-house gas emission reduction?	In response to the query, the representative of M/s Vikram Stoves explained the procedure of Green-house gas emission reduction calculation in brief.
Tasks to be undertaken by the users of Improved Cook stove for availing benefit?	Addressing to the query Mr. Yenale described the monitoring plan, the parameters to be monitored and steps to undertake by the user. Further to this, the representative from Vikram Stoves clarified that, improved cook stove users will get free maintenance service and also free of cost replacement of the system at the end of its lifetime within the crediting period.
Tenure during which the user will get this benefit?	Responding to the query Mr. Saheb, representative of M/s Vikram Stoves replied that, ICS systems considered under the project will receive free of cost maintenance service for 10 years post to registration.

2.3 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The improved cook stove conceived under the project activity is MNRE and BIS (Bureau of Indian Standard) approved state of art and environmentally sound technology. The improved cook stove is manufactured in accordance to IS13152 (Part 1): 1991 (Solid Biomass – Chulha Part 1(Metallic))[21]. The standard has been prepared in line with the national approach towards fuel conservation, better environment, mitigating health hazards and loss of forest cover caused by burning of wood as cooking fuel and therefore, can be conceived as an environmentally sound technology for combustion of solid biomass for the purpose of cooking. Moreover, the materials used in manufacturing of the cook stove are of iron and steel which is recyclable after end use and hence, considered to be environmentally safe after lifetime also. Although the ICS distributed under the current phase pertains to different batch of manufacturing, but since the products are being manufactured complying to a particular performance standard (IS13152 (Part 1):1991) the quality output for each unit of products complies to a minimum level.

The cook stove distributed under the project activity is a portable, single-pot stove without chimney, natural draft and metal made stove specifically suitable for combustion of solid biomass. The cook stove broadly comprises of a combustion chamber, top plate for holding the utensils, grate for holding fuel during combustion and bottom plate that facilitates ventilation of air. The combustion chamber is cylindrical shaped and made up

[21] The Standard has been prepared by Indian Standard body in line with the national approach towards fuel conservation and better environment, mitigating Health hazards and drudgery and loss of forest cover caused by burning of wood as cooking fuel (Forward: Indian Standard Solid Bio-Mass, Chulha – Specification Part 1 Portable (Metallic))

of mild steel. One side of the chamber of improved cook stove is opened for feeding of fuel. The chamber top plate is die cast and made up of cast iron.

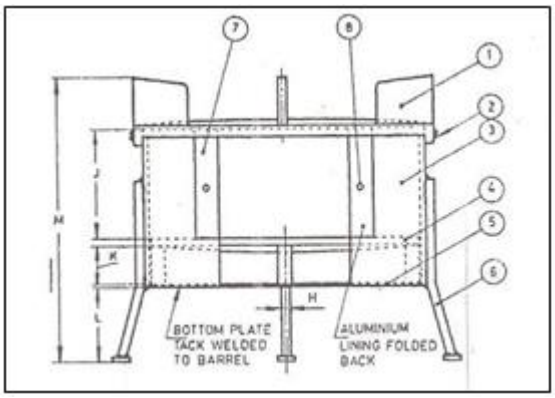
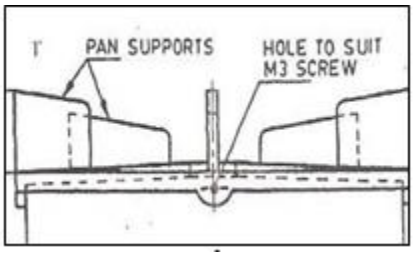
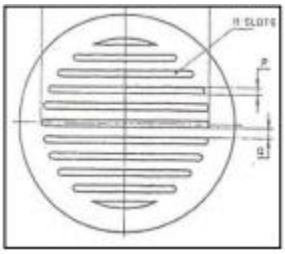


Diagram of Improved Cook Stove

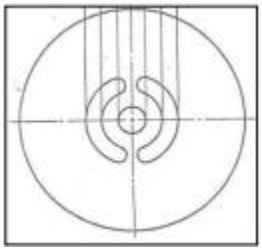
1. Top plate,
2. Screw,
3. Barrel,
4. Grate,
5. Bottom Plate,
6. Legs,
7. Aluminium Lining and
8. Rivet



Top Plate



Grate



Bottom Plate

Material used for manufacturing of each component of the cook stoves are:

Component	Material
Top plate	Cast iron
Grate	Cast iron
Barrel	Mild steel
Bottom Plate	Mild steel
Lining	Aluminum
Perforated Sleeve	Mild steel
Handle	Mild steel
Pan Support	Mild steel sheet-flat-rod
Legs	Mild steel sheet and rod

Life time
The operational lifetime of the cook stove is 5 years 00 months. As per manufacturer authorization the operational life of improved cookstoves is over seven years, however beyond five years the operational efficiency drops below the rated efficiency and hence was considered as operational life time in the registered PDD.

Decline in the cook stove efficiency as assessed through periodic efficiency testing is being reported and considered as part of emission reduction calculation.

Replacement of Improved Cookstoves
Replacement of ICS was scheduled to be carried out
(a) in case of breakage/ dismantle of ICS during the operational period – on receipt of complaint the localised service providers of the project proponent visits the beneficiary with backup cook stoves (ICS) and provides the beneficiary with backup stoves if the service provider fails to address the issues locally. The malfunctioned ICS post collected from beneficiary is thereafter sent to the company workshop in case of possibility of repair. In case the ICS couldn't be repaired beneficiary are to be provided with new ICS.
(b) Observed requirement of complex repair- In case the maintenance team of the project proponent during scheduled O&M observes requirement of complex repairs the team may on discretion replace the existing cookstoves with a new one or a backup one. In such case the beneficiary is provided with backup new ICS the same are to be replaced with the repaired one operating at the desired satisfaction level of beneficiary.
(c) Post assessment of operational efficiency in the last year after the elapse of scheduled lifetime of ICS from the date of distribution.

During the current monitoring period of 5 years there has been no instances of replacement of improved cook stoves, therefore no such impact on emission reduction calculation due to increase of cook stoves efficiency.

Operation and maintenance
Operation and maintenance of Improved cook stoves are carried out periodically by authorised representative of project proponent (manufacturer of improved cook stoves). The authorized representative of the project proponent during the annual (periodic) maintenance, also motivates and persuades the beneficiaries for continuation of ICS usages for cooking of all meals towards reducing the health impact of the family especially the women and children in case of usage of traditional cook stoves and thereby ensuring the restoration of operation of ICS.

Approach for assessing share of Improved cookstoves users for estimation of emission reduction

1. The number of beneficiaries using Improved cook stoves during a particular monitoring period are assessed based on record of operation and maintenance, maintained by project proponent pertaining to discontinued users.
2. Annual third-party sample survey is being carried out to assess the share of beneficiaries using improved cookstoves. During survey in case beneficiaries were evaluated to be using improved cook stoves for a limited period along with usage of traditional cookstoves the beneficiaries are considered as partial users. Partial users are beneficiaries /household, those who have not discontinued using of ICS but have been using ICS for a limited period and also using traditional cookstoves for the purpose of cooking along with ICS. Since the number of days of operation of partial ICS usage during a particular crediting period is hard to ascertain (uncertainty of estimation), therefore as a conservative approach the beneficiaries /household using ICS partially are considered as discontinued users.

   The survey observed/found most of the beneficiaries to have fully discontinued the usage of traditional cookstoves and have even dismantled the traditional cookstoves.

   Around 5-10% of beneficiaries during a particular crediting period have been assessed to have partially used traditional cookstoves (as deduced from the beneficiary survey) due to customary practice/festival or to manage guests. Considering the perceptive response of the beneficiaries regarding the number of day of functioning of traditional cookstoves, it is conservatively considered that the number of days of use of improved cookstoves for those particular beneficiaries who have used traditional cookstoves as zero/nil. Although such consideration negatively impacts the annualized emission reductions estimate but such consideration is being conservatively considered for the purpose of calculation.

3.2 Deviations

3.2.1 Methodology Deviations

Not Applicable

3.2.2 Project Description Deviations

Not Applicable

3.3 Grouped Projects

Not Applicable

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	B_{old}
Data unit	tonnes/ household/year
Description	Quantity of woody biomass used in absence of the project activity
Source of data	Teri Energy Data Directory Yearbook for 2010
Value applied	1.469
Justification of choice of data or description of measurement methods and procedures applied	The study as per Wood Fuel Trade in India – Food and Agricultural Organisation of the United Nation, July 2001, per capita per day biomass consumption of 1.52 kg and 5.6 kg of fuel wood consumption per household per day. Annual consumption per household per day is therefore estimated at 2.044 tonnes. **Further, the publication of TERI Energy Data Directory and Yearbook2010** outlines that, the per capita per month consumption of fire wood in Maharashtra at 25.51 kg/ month/capita. With average population size of 4.8 persons/household/the annual consumption of firewood is estimated at 1.469 tonnes/year/household. Being the annual household fuel consumption data estimated on the basis of the TERI Energy Data Directory is most conservative amongst the available fuel wood consumption figure available secondarily the value of 1.469 tonnes/household/year is considered for estimation of By, savings.
Purpose of Data	Quantity of biomass utilization is used to estimate the quantum of biomass that will be saved in the project scenario after factoring into the improvement of efficiency.
Comments	The maximum value of Bold is fixed at ex-ante. Factors calculated based on the number of days of traditional cook stove usage and number of days of improved cook stoves usage is multiplied with Bold to estimate the Bold to be used for emission reduction calculation.

Data / Parameter	η_{new}
Data unit	%
Description	Efficiency of the cook stove being deployed as a part of the project activity
Source of data	Test report issued by Biomass Cook stove Testing Centre, Dept. of Renewable Energy Sources, Udaipur
Value applied	29.88%
Justification of choice of data or description of measurement methods and procedures applied	Thermal efficiency test carried out as per water Boiling Test Protocol specified as per IS13152 protocol.
Purpose of Data	Efficiency of the improved cookstoves is used to estimate the saving in fuel wood. (The factor is not fixed ex-post and estimated based on monitored efficiency of sample number of cookstoves)
Comments	The value of Efficiency is monitored on an annual basis and vintage wise.

Data / Parameter	$B_{y,savings}$
Data unit	tonne/household/year
Description	Quantity of woody biomass saved due to implementation of the project activity
Source of data	Calculated
Value applied	0.9774
Justification of choice of data or description of measurement methods and procedures applied	$B_{y,\ savings\ is}$ calculated using equation $B_{y,\ savings} = B_{old} * (1- \eta_{old}/ \eta_{new})$ =1.469*(1-0.1/0.2988) =0.9774 tonne /household/year
Purpose of Data	Fuel wood saving is calculated for estimation of emission reduction.
Comments	The efficiency of the improved cook stoves is monitored on an annual basis based on the sample survey and if appliances are found to be operational with lower efficiency then, the actual efficiency determined during monitoring is considered to calculate emission reduction.

Data / Parameter	**Energy Saving per cook stove or household**

Data unit	GWh_{th}/household/year
Description	Energy saving per cook stove due to improved efficiency of the distributed cook stove
Source of data	Calculated
Value applied	0.00407
Justification of choice of data or description of measurement methods and procedures applied	Energy Saving = $B_{y,\ saving}$ * $NCV_{biomass}$ = Bold * (1- η_{old}/η_{new})* $NCV_{biomass}$ = 1.469 * (1- 0.1/0.2988) * 0.0150 = 0.01466 TJ /household /year = 0.00407 GWhth/household/year = 4.073 MWhth/ household/year = 1.358 MWhe / household/year Note: Value of $NCV_{biomass}$ is considered as per Paragraph 5 of the applicable methodology AMS -II. G. Version 03; IPCC default value for fuel wood i.e. 0.015 TJ/tonne is chosen.
Purpose of Data	The data is used to assess the applicability condition of the project under micro small scale guidelines and also de-bundling.
Comments	-

Data / Parameter	$F_{NRB,y}$
Data unit	-
Description	The factors relates to the fraction of non-renewable biomass
Source of data	Calculated using secondary sources
Value applied	87.9%
Justification of choice of data or description of measurement methods and procedures applied	The fraction of non-renewable biomass is calculated based on the fuel wood demand and supply of biomass across the state of Maharashtra.
Purpose of Data	Data is used for estimation of emission reduction.
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	η_{new}
Data unit	%

<table>
<tr><td>Description</td><td>Efficiency of the system being deployed in project activity</td></tr>
<tr><td>Source of data</td><td>Third party efficiency test report.</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>The sample systems tested as per Water Boiling Test Protocol indicated in IS 13152 (Part 1): 1991 for solid biomass cook stove. The testing is carried out on annual basis of representative sample. The minimum value of tested efficiency or 29.88% which so ever is lower is used to calculate emission reduction of the systems for particular year of operation.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Efficiency of the improved cookstoves under operation is monitored across sample system on an annual basis</td></tr>
<tr><td>Value monitored</td><td>
<table>
<tr><th>Period</th><th>Date of Monitoring</th><th>Number of Improved cookstoves assessed</th><th>Minimum efficiency of the lot</th></tr>
<tr><td>01-November-2012 to 31-October-2013</td><td>30/12/2013, 31/12/2013, 03/1/2014-04/1/2014, 27/12/2013-28/12/2013</td><td>40</td><td>27.08%</td></tr>
<tr><td>01-November-2013 to 31-October-2014</td><td>12/12/2014-13/12/2014 5/12/2014-6/12/2014 8/12/2014-9/12/2014</td><td>40</td><td>26.92%</td></tr>
<tr><td>01-November-2014 to 31-October-2015</td><td>1/12/2015-2/12/2015 6/12/2015-7/12/2015 3/12/2015-4/12/2015</td><td>40</td><td>26.71%</td></tr>
<tr><td>01-November-2015 to 31-October-2016</td><td>01/12/2016-02/12/2016, 06/12/2016-07/12/2016 04/12/2016-05/12/2016</td><td>40</td><td>26.03%</td></tr>
<tr><td>01-November-2016 to 31-October-2017</td><td>7/12/2017-8/12/2017 13/12/2017-14/12/2017 10/12/2017-11/12/2017</td><td>40</td><td>26.01%</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>1. Digital Thermometer
2. Weighing scale</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Efficiency of the system is tested by third party agency on principle of the Water Boiling Test Protocol indicated in IS 13152 (Part 1): 1991. The number of sample system to be inspected is estimated in accordance to “Guidelines for Sampling and Surveys for Project Activities and Programme of Activities" Version 02, EB 69 Annex 5 and procedure for sample size calculation is specified in Section B.7.2 of the CDM PDD.</td></tr>
<tr><td>Purpose of the data</td><td>The value of the efficiency is used to calculate the $B_{y,\ savings}$ used for ex-post estimation of emission reduction.</td></tr>
</table>

Calculation method	**Heat utilized** = (n-1)×(W×0.214+w) ×(t2-t1) + (W×0.214+w) ×(t3-t1) kcal **Heat Produced** = [(X×c1)+(x×d/1000×c2)] kcal **Thermal Efficiency** = Heat utilised/ Heat Produced×100 **Where**

w	Mass of water in vessel, in kg
W	Mass of the vessel complete with lead and stirrer, in kg
X	Mass of the fuel consumed, in kg
c_1	Calorific value of wood in kcal/kg
x	Volume of the kerosene consumed, in ml
c_2	Calorific value of kerosene in kcal/kg
d	Density of kerosene, in g/ml
t_1	Initial temperature of the water, in ^{0}C
t_2	Final temperature of the water, in ^{0}C
t_3	Final temperature of the water in the last vessel at the completion of the test, in ^{0}C
n	Total number of vessels used
0.214	Specific heat of aluminium in kcal/kg^{0}C

Comments	As a part of the third party sample assessment of the operational efficiency of improved cookstoves, the minimum of the assessed efficiency from amongst the fourty system tested below 29.88% is considered as a efficiency to be considered for purpose of emission reduction calculation in place of 29.88% (rated efficiency). Although the ICS distributed under the current phase pertains to different batch of manufacturing, but since the products are being manufactured complying to a particular performance standard (IS13152 (Part 1):1991) the quality output for each unit of products complies to a minimum level. Moreover, the distribution is carried out during same period amongst homogeneous beneficiary segment, moreover the onset of operations of ICS has been kept at the same point of time. Therefore, as per the guidelines specified under the registered PDD Simple Random sampling methods were selected. The data estimated is archived both in paper and electronic spread sheet whereby the paper and the electronic form of the documents is maintained by the Project Participant for period of two year and electronic data is maintained till 2 years after the last issuance.

Data / Parameter	**No. cook stoves in use**

<table>
<tr><td>Data unit</td><td>Number</td></tr>
<tr><td>Description</td><td>The number of improved cook stoves distributed to households under the project activity and under operation.</td></tr>
<tr><td>Source of data</td><td>Third party agency survey report and database managed by the Project Participant (the end user agreement)</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>The monitoring consists of third-party survey of representative sample on annual basis to evaluate the number of systems in operation. The percentage of cook stove in usage as estimated from the survey result is multiplied with the total number of cook stove to determine number of cook stove in operation and to be considered for the purpose of emission reduction calculation.</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Number of improved cookstoves under operation is monitored annually based on sample survey</td></tr>
<tr><td>Value monitored</td><td>During survey in case beneficiaries were evaluated to be using improved cook stoves for a limited period along with usage of traditional cookstoves the beneficiaries are considered as partial users. Partial users are beneficiaries /household, those who have not discontinued using of ICS but have been using ICS for a limited period and also using traditional cookstoves for the purpose of cooking along with ICS. Since the number of days of operation of partial ICS usage during a particular crediting period is hard to ascertain (uncertainty of estimation), therefore as a conservative approach the beneficiaries /household using ICS partially are considered as discontinued users for the purpose of estimating emission reduction.
<table>
<tr><th>Period</th><th>No. of Dis-continued user</th><th>Date of Survey</th><th>Number of beneficiaries surveyed</th><th>% of partial users</th><th>% of users used ICS only</th></tr>
<tr><td>01-November-2012 to 31-October-2013</td><td>0</td><td>30/12/2013, 31/12/2013, 03/1/2014-04/1/2014, 27/12/2013-28/12/2013</td><td>160</td><td>6.25%</td><td>93.75%</td></tr>
<tr><td>01-November-2013 to 31-October-2014</td><td>0</td><td>12/12/2014-13/12/2014 5/12/2014-6/12/2014 8/12/2014-9/12/2014</td><td>160</td><td>8.75%</td><td>91.25%</td></tr>
<tr><td>01-November-2014 to 31-October-2015</td><td>0</td><td>1/12/2015-2/12/2015 6/12/2015-7/12/2015 3/12/2015-4/12/2015</td><td>160</td><td>10.00%</td><td>90.00%</td></tr>
<tr><td>01-November-2015 to 31-October-2016</td><td>0</td><td>01/12/2016-02/12/2016, 06/12/2016-07/12/2016 04/12/2016-05/12/2016</td><td>160</td><td>9.37%</td><td>90.63%</td></tr>
<tr><td>01-November-2016 to</td><td>0</td><td>7/12/2017-8/12/2017</td><td>160</td><td>11.25%</td><td>88.75%</td></tr>
</table></td></tr>
</table>

	31-October-2017 | | 13/12/2017-14/12/2017 10/12/2017-11/12/2017 | | | | Number of Improved Cook stoves distributed – 14,046
Monitoring equipment	-
QA/QC procedures to be applied	The project proponent obtains an authorization from each /group of the household in form of end user agreement for processing of carbon revenue. The database containing all information of the end user agreement is maintained in a central server located with project participant and accessible to the project team at different locations. During the time of verification, the VVB can verify the list of beneficiaries who has signed the end user agreement (for which the emission reductions are claimed).
Purpose of the data	For estimation of baseline emission
Calculation method	Share of beneficiaries using Improved cookstoves $= \frac{160 - \text{no of partial users}}{160}$
Comments	The percentage of the representative sample using the improved cook stove determined from the sample survey is used to calculate the total number of cook stoves in operation. The survey report is kept and maintained by the project proponent for the period of two years after the last issuance. Since, the distribution of Improved cook stoves is carried out during same period amongst homogeneous beneficiary segment, and moreover the onset of operations of ICS has been kept at the same point of time. Therefore, as per the guidelines specified under the registered PDD Simple Random sampling methods were selected.

Data / Parameter	**Days of Operation**
Data unit	Number
Description	The parameter relates to the number of days for which the cook stove in operation during the particular year
Source of data	Monitoring Database
Description of measurement methods and procedures to be applied	The emission reduction as against the cook stove is calculated when the system is being delivered to the end user, the end user initiated its operation and the end user agreement is being signed. Since, the emission reduction is based on the days of operation therefore, it is important to monitor the number of days of non-functioning. The days of non-functioning is estimated based on the number

<table>
<tr><td></td><td>of days between the date of complaint as against damage or non- functioning received and date of repair or replacement. The information is maintained in form of database and archived.

Number of days of operation = 365–Average number of days the cook stove was non-functional

The number of non-functional days is based on the number of days the cook stoves were under repair/replacement</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Days of operation of improved cookstoves under operation is monitored annually based on sample survey</td></tr>
<tr><td>Value monitored</td><td><table>
<tr><th>Period</th><th>Total number of beneficiaries</th><th>Number of beneficiaries for which defunct date was a day/more</th><th>Average days of operation</th></tr>
<tr><td>01-November-2012 to 31-October-2013</td><td>14,046</td><td>0</td><td>365</td></tr>
<tr><td>01-November-2013 to 31-October-2014</td><td>14,046</td><td>0</td><td>365</td></tr>
<tr><td>01-November-2014 to 31-October-2015</td><td>14,046</td><td>0</td><td>365</td></tr>
<tr><td>01-November-2015 to 31-October-2016</td><td>14,046</td><td>0</td><td>365</td></tr>
<tr><td>01-November-2016 to 31-October-2017</td><td>14,046</td><td>0</td><td>365</td></tr>
</table></td></tr>
<tr><td>Monitoring equipment</td><td>-</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>The database for the date of dissemination of cook stoves, date of receipt of complaint for repair/ replacement and the date of repair/replacement is recorded by the village coordinator. The related information is maintained by the village co-ordinator and passed on to the VCS team on a monthly basis. In case of the cook stove being replaced, a new end user agreement is signed with the end user and attached to the original agreement. Monitoring database and the end user agreement is maintained both in soft as well as hard copy.</td></tr>
<tr><td>Purpose of the data</td><td>For estimation of baseline emission</td></tr>
<tr><td>Calculation method</td><td>-</td></tr>
<tr><td>Comments</td><td>The number of days for which the improved cook stoves were non-functional is considered for estimation of emission reduction. The record of database and copy of end user agreement is kept and maintained by the project participant for the period of two years after the last issuance.
For ex-post, the total number of days of non-operation of the improved cook stoves due to repair, maintenance is retrieved from the maintenance log books is averaged as against the total number of cook stoves in actual operation (as per survey) and is considered.
Say, if n is the total no of non- operational days as per the maintenance records of all of the cook stoves, the average</td></tr>
</table>

	days of non-operation for each cook stove is estimated as = n/x where x is the number of cook stoves in actual operation as per the sample survey.

Data / Parameter	**Number of days of functioning of traditional cook stoves**
Data unit	Number
Description	The parameters refer to the number of days for which the traditional cook stove is being used by the household.
Source of data	Annual third-party agency survey of representative sample household
Description of measurement methods and procedures to be applied	Survey is carried out to estimate the number of days for which the household has operated the traditional cook stove during a particular monitoring period.
Frequency of monitoring/recording	Number of days of functioning of traditional cook stoves is monitored annually based on sample survey
Value monitored	0 During survey in case beneficiaries were evaluated to be using improved cook stoves for a limited period along with usage of traditional cookstoves the beneficiaries are considered as partial users. Partial users are beneficiaries /household, those who have not discontinued using of ICS but have been using ICS for a limited period and also using traditional cookstoves for the purpose of cooking along with ICS. Since the number of days of operation of partial ICS usage during a particular crediting period is hard to ascertain (uncertainty of estimation), therefore as a conservative approach the beneficiaries /household using ICS partially are considered as discontinued users. Since the beneficiary using traditional cookstoves were opted out of emission reduction estimation therefore the beneficiaries considered resembles only to those who are using improved cookstoves. Therefore the days of usage of traditional cookstoves for beneficiaries considered is zero.
Monitoring equipment	-
QA/QC procedures to be applied	The survey is carried out by third party agency and is co-ordinated by the project proponent.
Purpose of the data	For estimation of baseline emission
Calculation method	-
Comments	Number of days of operation of the traditional cook stove is obtained from the result of sample survey. The number of days of traditional cook stove as per the survey is used to obtain the average days of usage of the traditional cook stoves for all the

	households who still use the improved cook stoves of this project activity. This average day is used to arrive at a factor - = (365- Average number of days of traditional cook stove usage in all households /365)

Data / Parameter	**Number of Cook stove replaced**
Data unit	Number
Description	The parameters refer to the number of cook stove that are replaced (due to end-of-life time or damage) by the new cook stove with efficiency greater than or equal to 29.88%.
Source of data	Monitoring database, new end user agreement and test certificate of the new system supplied.
Description of measurement methods and procedures to be applied	Record is being updated in the databases as and when the improved cookstoves are replaced by a new one . On replacement a new end user agreement is signed with the existing end user and the information relating to the replacement along with necessary details is updated in the database.
Frequency of monitoring/recording	Recorded as and when replaced
Value monitored	
Monitoring equipment	-
QA/QC procedures to be applied	The copy of the new end user agreement for the replaced cook stove along with the efficiency certificate of the new system is archived along with the existing agreement. The database is updated as and when the system is replaced.
Purpose of the data	Assessment of baseline emission
Calculation method	-

Period	Number of improved cookstoves distributed and under operation	Number of cookstoves replaced post end of life time	Number of cookstoves replaced due to defunct
01-November-2012 to 31-October-2013	14,046	0	0
01-November-2013 to 31-October-2014	14,046	0	0
01-November-2014 to 31-October-2015	14,046	0	0
01-November-2015 to 31-October-2016	14,046	0	0
01-November-2016 to 31-October-2017	14,046	0	0

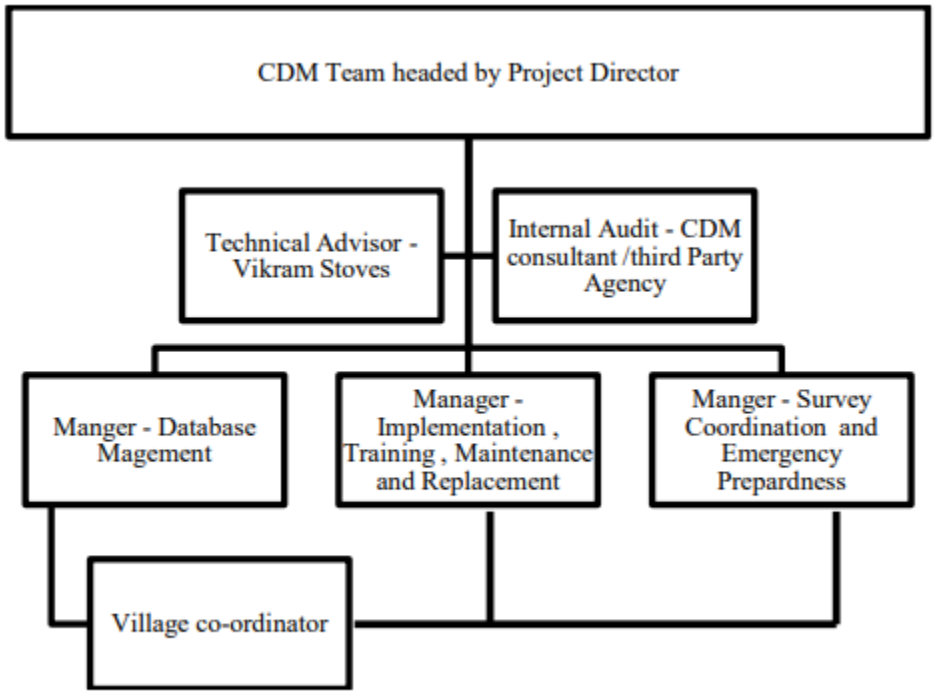
Comments	The record of database and copy of end user agreements (both new and old one) is maintained by the project participant for the period of two years after the last issuance.

Data / Parameter	$B_{y, savings}$
Data unit	Tonnes/year/household
Description	Quantity of woody biomass that is saved through the project activity.
Source of data	calculated
Description of measurement methods and procedures to be applied	The quantity of woody biomass saved is calculated following the equation $B_{y, saving} = B_{old} * (1- \eta_{old}/\eta_{new})$ Where, B_{old} is calculated based on number of days cook stove is operational as calculated above and per capita biomass consumption of 25.51 kg/person/month multiplied by 4.8 members per rural household also factoring into the number of days for which the traditional cook stoves were in operation and the number of days of non-functioning of the improved cook stoves. The efficiency of the project system is tested on a representative sample basis.
Frequency of monitoring/recording	Calculated on an annual basis
Value monitored	(see table below)
Monitoring equipment	-
QA/QC procedures to be applied	The minimum tested efficiency of the representative samples or 29.88% is used for $\eta_{new.}$
Purpose of the data	-
Calculation method	-
Comments	The data estimated and the survey related documents is archived by the project participant for the period of 2 years after the last issuance.

Period	Operational Efficiency considered	Estimated By savings/ ICS
01-November-2012 to 31-October-2013	27.08%	0.9266
01-November-2013 to 31-October-2014	26.92%	0.9233
01-November-2014 to 31-October-2015	26.71%	0.9189
01-November-2015 to 31-October-2016	26.03%	0.9046
01-November-2016 to 31-October-2017	26.01%	0.9042

4.3 Monitoring Plan

The monitoring of the Project activity is executed by the team of the Project Participant, Village level coordinator appointed by the Project Participant, Technical Advisor from Vikram Stoves and consultant whose specific role and responsibilities are explained as follows. The following section also explicitly indicates the monitoring plan, implementation and record archiving procedure, management of monitoring, facilitating survey, training, maintenance plan and emergency preparedness.
The detailed team structure for executing the monitoring is as follows:



Roles and Responsibilities
The roles and responsibilities of the team include:

- Undertaking awareness amongst the beneficiaries relating to usefulness of the cook stoves.
- Providing training to each entity on the operating methods and regular maintenance practice of improved cook stoves.
- Undertaking maintenance of the cook stoves on a periodic basis.
- Replacing supplied improved cook stoves with new one at the end of technical life time of the distributed system within the crediting period.
- Development and monitoring of project.
- Undertaking spot check, annual survey to access the usage, functional efficiency, maintain database and facilitate monitoring as described in section B.7.as well as the following section of the PDD.

The end users or beneficiaries is responsible for -

- Continual usage of cook stoves
- Undertaking regular maintenance
- Supporting the village coordinator and the project participant in undertaking monitoring
- Inform the village coordinator in case the cook stove malfunctions.

- Dismantle or refrain from use of traditional cook stove
- In case the family decides to shift to the same is intimated to the village coordinator.

The purpose of monitoring is to achieve actual and credible emission reduction estimation pertaining to the project activity. The project participant therefore, needs to monitor and archive data required for estimation of emission reduction.

According to the approved methodology AMS -II. G.; the monitoring comprises of –

1. Efficiency check of the representative sample on annual basis to ensure that, the cook stoves are still operating at the specified efficiency (ηnew). If appliances are found to be operational with efficiency lower than 29.88%, the efficiency determined during monitoring is used to calculate emission reduction. (In accordance to Paragraph 15 of the approved methodology)
   - Thermal efficiency test is carried out in accordance to the Water Boiling Test Protocol as specified in IS 13152 (Part 1): 1991 standard.
   - The sample size is selected in accordance to "Guidelines for Sampling and Surveys for Project Activities and Programme of Activities" Version 2, EB 69.

2. Monitoring also consists of checking of representative sample on annual basis to determine if the improved cook stoves are still operating or are replaced by an equivalent in service appliance. In case of replacement, it is ensured that, efficiency of new equipment is similar to the equipment being replaced.
   If the cook stove is replaced with higher efficiency appliances, then, the efficiency of 29.88% is considered as conservative approach. (In accordance to Paragraph 16 of the methodology)

3. Monitoring ensures that:

a. Either the replaced low efficiency appliances are disposed of and not used within the boundary or within the region; or

b. If baseline stoves continue to be used, monitoring ensures that the fuel-wood consumption of those stoves is excluded from Bold.

Therefore, the project proponent has developed a plan for monitoring under the following heads –

Implementation Arrangements and Record archiving-
All the household post to the distribution of the cook stoves is oriented to its usage and regular maintenance. With registration of the project under the UNFCCC; the project participant imparts an awareness session over cookstove usage.

As a part of the implementation program the project participant ensures:

1. Signing of the end user agreement with the beneficiaries (the project participant completes signing of end user agreement with all the beneficiaries who are being provided with the cook stoves before registration of the project). As a part of the contractual agreement with each of the beneficiaries for the titled project a unique identification number is issued as against to each project cook stoves. Moreover, as a part of the agreement each of the end user ascertains that they won't be entering into agreement with other agencies to obtain revenue. The above two steps nullify the chances of double counting.
2. The coordinators are employed under the project activity and is responsible for monitoring, archiving of the records and undertaking maintenance.

3. Creating database to archive relevant information about the end user, cook stoves and related information of the end user agreement. The database is created based on the end user agreement and is managed by the team. The database contains all the relevant information about the beneficiary in regard to the end user agreement. Each of the beneficiaries in the database is identified by the unique identification number. The database manager ensures that there has been no double counting/ repetition of the beneficiary information, location and unique identification number of the cook stoves. The database is updated on a regular basis to include:
   a. Replacement of the cook stoves after schedule life time
   b. Scheduled maintenance
   c. Unscheduled maintenance or fault rectification measures undertaken
   d. Temporary or permanent drop out

Finalizing the number of cook stoves for emission reduction estimation
As described in the section above in regard to the implementation arrangement and record archiving the dissemination of the cook stove to the household and its usage thereafter includes the following steps:

1. Signing of end user agreement
2. Dissemination of improved cookstoves

In accordance to the guidance of the methodology, emission reduction as against each cook stoves can only be estimated from the point of cook stove usage. Therefore, the date of dissemination of cook stoves and signing of the end user agreement with each beneficiary after dissemination is considered as the date from where the emission reduction calculation is initiated for each cook stove for the first monitoring period. For the purpose of estimation, the end date of cookstoves dissemination is considered as start date of the monitoring period.

Management of monitoring activities
The monitoring of the project activity is reviewed and coordinated by the top management of the Project Participant (GKEMPL) through Monitoring Coordinator, team of Project Participant (GKEMPL) headed by Project Director and technical team from Vikram Stoves.

The persons and staffs involved in monitoring is trained over the procedure in accordance to the manual and works out under the supervision of the Project Director. The major task to be undertaken and the responsibility are as follows:

1. Co-ordinator: Each coordinator acts as coordinating point between the project household and the Team (respective manger). The village coordinator is responsible to facilitate and oversee continual operation of cook stoves, maintain database related to number of cook stoves distributed and replaced thereafter, filing complain relating to non-functioning and undertaking on-call maintenance, recording of the complaint and maintenance time line and periodic submission of information to the team.
2. Team: Creating and maintaining database and end user agreement, up-gradation of beneficiary level information in the central database. The team monitors related

information pertaining to the replacement of the cook stoves[22]. In case household considered under the project activity fails to meet the condition of the end user agreement or household drops out (because of the shift to location outside project boundary for employment purpose/migration for a temporary period or even the beneficiary decided to discontinue usage of improved cook stoves) then, such dropout household is conservatively deducted on temporary or permanent basis from the emission reduction calculation for the particular monitoring period. The VCS team is responsible for estimating the emission reduction.

3. Maintenance team – Vikram Stoves is responsible for imparting training relating to the cook stove scheduled maintenance and undertaking periodic maintenance and on-call maintenance.
4. Daily usage- Household uses cook stove and intimate from time to time relating to non- functioning or temporary transfer/migration. The coordinator on basis of the usage report intimates the team.
5. Replacement of Existing improved cook stoves: In case the old cook stove is replaced by a new cook stove the same is to be done with similar or higher efficiency of existing cook stove (29.88%). On replacement a new end user agreement is signed with the existing end user the same information relating to the replacement along with necessary details is updated in the database. The copy of the new end user agreement for the replaced cook stove along with the efficiency certificate of the new system is archived along with the existing agreement. The database is updated as and when the system is replaced. The replaced cook stoves is dismantled and sold out to the cast iron and steel units respectively in order to recycle the system components. Such initiatives nullify the chances of the replaced cook stove to be re-used.

Monitoring of Traditional cook stove usage

The traditional cook stove is considered as an auspicious with religious value and household consider it as a linkage to their tradition so, the household has kept the stove. However, each household has assured and confirmed through signing of end user agreement with the project participant to continue using of improved cook stoves at household.
However, as a conservative approach to monitor fuel wood consumption in the project household from use of existing mud cook stove, third party survey is carried out of representative sample household on annual basis to evaluate the number of days for which the traditional stoves has been operated across the year. The number of days for which the traditional stoves were in operation is used to derive the factor to be adjusted with B_{old}. The factor is calculated as follows:
= (365 – Average No. of days of traditional cook stoves usage in all households) /365

The factor calculated using above approach is multiplied with B_{old} to calculate the value of B_{old} to be used for ex-post calculation of emission reduction.

Sampling design

Objective: The objective of the sample design is to determine –

[22] The replaced cook stoves is to dismantled and sold out to the cast iron and steel units respectively in order to recycle the system components. Such initiatives nullifies the chances of the replaced cook stove to be re-used.

a) **Efficiency of Improved cook stove in operation:** Efficiency of the system is tested by third party agency of a representative sample on principle of the Water Boiling Test Protocol indicated in IS 13152 (Part 1): 1991.
b) **Usage Survey** – This is conducted on annual basis to determine the number of cook stove in operation. The survey is initiated after a year from date of project registration.
c) **Usage of traditional cook stoves**: The survey is conducted to determine the number of days for which the household is using the traditional cook stoves.

Reliability Requirement: As per paragraph 22 of the approved methodology AMS - II.G; 90% confidence interval and 10% margin of error needs is considered conceiving the fact that survey is carried out on an annual basis.

Target Population: The number of cook stove conceived under the project activity is 14,046.

Survey Method: Simple Random sampling is chosen, as the population under the project activity are homogeneous owing to the selection of beneficiary from similar socio-economic circumstances.

Sample Size:

The sample size is calculated using exact equation for random sampling –

$n \geq 1.645^2 N * p * (1-p) / ((N-1) * 0.1^2 * p^2 + 1.645^2 * p*(1-p))$

Where,

N	=	Sample size
N	=	14,046
P	=	expected proportion (on basis of assumption that, 90% of the cook stove is in operation and at the desired efficiency)
1.645	=	Represents 90% confidence required
0.1	=	Represent 10% relative precision

In accordance to approved monitoring plan under the Registered PDD, project proponent needs to undertake monitoring of operating efficiency of the improved cookstoves (by means of water boiling test) and number of days operation of improved cookstoves and or/traditional cookstoves on a sampling basis.

The number of samples is being estimated based on “Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities”, Version 2 considering the target population of 14,046.

n≥	1.645^2 * N * p * (1-p)		
	(N-1) * 0.1^2 * p^2 +1.645^2p * (1-p)		
Where			
n	Sample size		

N	Total number of households	14,046	
p	Expected proportion	0.9	It is assumed that 90% of the cook stove that are determined to be in operation will operate at the desired efficiency
1.645	Representing 90% confidence level		
0.1	Represents 10% relative precision		
n	31		

Sample Size for number of cookstoves for water boiling test

Considering that 80% of the beneficiary selected will be responsive the number of beneficiaries to be surveyed was estimated as 39 beneficiaries (31 beneficiaries /80% response rate).

Sample Size for number of cookstoves for assessing number of cookstoves in operation

The estimated sample size is 39 beneficiaries for assessing number of cookstoves in operation. However, to cover the wide range of population PP selected 4 times the number of samples estimated i.e., 156 numbers of household every year for the sample.

a) Sample size for Efficiency test

Although the cook stoves are designed to operate at a desired efficiency level throughout its life time subjected to periodic maintenance; efficiency test of the cook stoves is carried out on annual basis. The sample size for undertaking efficiency test is therefore, decided considering 90% of the cook stoves operates at a specified efficiency of 29.88%.

Following equation (3) above, the number of sample size arrived as below –

Time Period	**Percentage of cook stove operational at specified efficiency at any point of time during the entire crediting period (***This assumption is only for estimation of sample size***)[62]**	**Sample size for survey (No. of systems)**	**Sample size after conceiving response rate of 80%**
Annual	90%	31	40

(Note: the final sample size is rounded up and increased to the next closest integer)

The household for testing the efficiency as stated above is selected on a random sample basis. However while undertaking the sample beneficiary selection it is ensured that the household opted for efficiency testing are not common with the household /beneficiary selected for sample survey for improved cook stove usage and traditional cook stove usage during a particular year. Moreover, it

is ensured that the household once selected for efficiency testing during a particular year is opted out from the selection procedure in course of the crediting period for further testing.

Data to be collected -

Field Measurement – Frequency: The efficiency testing of sample system is carried out on an annual basis. The inspection is carried out one year after the date of registration. There after once in every year the survey is conducted.

QA/QC Procedure: Each system is assigned with unique identification details. The systems to be sampled is randomly selected using software or random number tables and screen shots of the same is kept in the data base. The PP gets the services of third party agency or any scope accredited DOE including the verifier for conducting the efficiency test of the samples presented by the PP before the preparation of the monitoring report.

Analysis: In case of the efficiency tested for the sample system is found to be lower than 29.88% then, the minimum value of efficiency tested is considered as a threshold for the subsequent years in place of 29.88% till the point further lower value of efficiency is tested.

b) Sample size determination for no. of improved cook stoves in operation and no of days of traditional cook stove usage

The sample size is estimated for determining the number of cook stoves in operation on basis of assumption that, 90% (This assumption is only for estimation of sample size) of cook stove is operational i.e. proportion of the cook stove in operation during a particular year is 0.9.

Therefore, n≥ 31

For covering 100 percent of the sample and expecting a response rate of 80%. Thus, the sample size is estimated as 31/80% = 39. However, to cover the wide range of population and have a conservative sample the PP selects 4 times the number of sample estimated i.e., 156 numbers of household every year for the sample.

The household survey is designed to estimate the percentage of cook stove still in operation and number of days for which the traditional cook stoves are used for the purpose of estimation of emission reduction. The survey questionnaire essentially contain the unique identification details of the household, satisfactory level of usage and service, date of signing of the agreement, information regard to the maintenance or replacement if any, number of person in the household, other type of stoves used if any (type of fuel) and number of days of traditional cook stove usage (specific details about the festive season and any other occasion the traditional cook stove is used, if the size of the members are extremely high when it is not possible to use the improved cook stove).

It is to be noted that the household selected for the usage survey for determination of proportion of cook stove in operation is common where the survey for determining the number days for which the traditional cook stoves usage is carried out. The samples once surveyed in a year is not considered for subsequent year.

Data to be collected

Field Measurement – Frequency: The survey is carried out on an annual basis from the date of registration in specified format duly signed by the beneficiary to assess whether the beneficiary has been using the cook stoves distributed till date and to assess the number of days for which the beneficiary has used the traditional cook stoves during that year.

QA/QC Procedure: Each system is assigned with unique identification details. The systems to be sampled is randomly selected using software or random number tables and screen shots

of the same is kept in the data base. The PP gets the services of third party agency or any scope accredited DoE including the verifier for taking the survey before the preparation of the monitoring report.

Analysis: Based on the response the percentage of improved cook stoves which are distributed as the part of this project activity that are still operated by the households and the average number of days of operation of the traditional cook stoves by each household would be estimated and the same is considered for ex-post emission reduction calculation.

The sample beneficiaries/household is same where the survey is carried out for estimation of operation of improved cook stoves and traditional cook stoves i.e. a single survey is designed to capture both. Moreover, it is ensured that the household once selected for survey during a particular year is opted out from the selection in course of the subsequent crediting period for further testing.

Sl. No.	Description	Data to be collected	Method of survey	Sampling method	Proposed Sample size	Variance
1	Efficiency of Improved cook stove	Testing of the Efficiency of the improved cook stoves	Household Collection and conducting the test for the selected samples.	Simple Random sampling	40	90% Confidence level
2	Usage survey	No of system in operation	Household survey	Simple Random Sampling	160 household/ annum	90% confidence level
	Traditional cook stove usage	No of days for which the household use traditional cook stoves are used in the project household	Household survey	Simple Random Sampling	160 household/ annum	90% confidence level

Reliability Check

The sample size as indicated in the table above is subjected to the final value of the precision calculated and in case the value of the precision estimated from the survey result is less than ±10% then, the sample size is re-estimated and the additional number of beneficiary/households is interviewed to obtain the desired level of precision. The precision is calculated as follows:

Step1: Estimation of the value of proportion (p)
P = number of success/ number of cook stoves that were observed in the sample

Step 2: Estimating Standard Error of the proportion
The standard error of the proportion is estimated using the following equation Standard error of proportion = $\sqrt{(1-f)\ pq/n}$
Where,
f = sampling fraction = number of cook stoves that are observed in the sample/14,046, i.e., 160/14,046. p = proportion, 90%

q = (1-p)
n = number of cook stoves that are observed in the sample

Step 3: Estimating of Precision
Proportion=±z value * standard error of proportion
z value = for 90% confidence level the value of z is 1.645 Standard error of proportion = estimated in step 2

Step 4: Estimating of Relating Precision Relative Precision = Precision/proportion Where,
Proportion is estimated in step 1 and precision in step 3
In case the value of the relative precision estimated based on the level of success relating to

1. Tested Efficiency of the improved cook stove being equal to greater than 29.88%
2. Number of the beneficiaries using improved cook stove
3. Number of beneficiaries/households using traditional cook stoves is not within the specified limit of ±10% the value of sample size is increased and survey is carried out amongst the additional population to obtain the desired level of precision i.e. within ±10%.

Training
The training is imparted to the following entities in following way-

Entity	**Objective of training**	**Trained by**	**Onset**	**Frequency**
Household	Operational procedure Scheduled maintenance Itemised recording and reporting	Vikram Stoves (for item no 1. and 2) team (for item 3)	After distribution	Once
Village Coordinator	Monitoring of the related parameter like Spot check of cook stove usage, situational review Database management and coordination with team System Maintenance	VCS team (for item no. 1 and 2) Vikram Stoves (for item 3)	On appointment	Once in a year
VCS team	Database management Undertaking Monitoring, Recording and archiving Preparation of monitoring report	Consultant and Top Management of the Project participant	On registration	Once in a year

Quality Assurance and Quality Control of monitoring activities–
Top management of the Project participant (GKEMPL) is responsible for QA/QC which includes monitoring of accurate and transparent record keeping, monitoring and evaluation so that all supporting documentation and records for the project is easily accessible for spot checking and cross referencing by a third-party agency. Top management of the project participant ensures quality control of the monitoring activities in order to guarantee of records and to confirm absence of double-counting in any form. Project participant ensures that, the detailed beneficiary level database and the project database is up to date and the latter is representative of the most recent definitions of clusters. Internal audit is carried out on six month basis by the consultant or third party agency and includes -

1. The internal review is carried out in every six month for compliance check in accordance to the manual.
2. Non conformity if noted is reported and brought into the notice of the top management and measures is undertaken to ensure that required compliance is met.
3. Training on the monitoring if felt by the auditor is imparted to the team.

Emergency Preparedness
In case the village coordinator is reported against malfunction/ non-function of cook stove which the technical team is unable to rectify the fault and unable to co-ordinate with the technical team of Vikram Stoves; the coordinator immediately replace the existing cook stove with the new one. The faulty stoves thereafter be transported to the industry for repair.

1. The coordinator is provided with stand-by stove components for repair and/or replacement.
2. Few numbers of cook stoves are stocked with the Panchayat Samity/ Block Development Office to reduce the down time of replacement.
3. In case the coordinator is unable to carry out maintenance, the same is reported to the technical team of Vikram Stoves and the nearby representatives visits the village to support the co- Ordinator in rectifying the fault.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline Emissions is estimated in following way –

$ER_y = B_{y,\ savings} * f_{NRB,y} * NCV_{\ biomass} * EF_{projected\ fossil\ fuel}$

Where, in accordance to paragraph 13 of the methodology, leakage related to the non-renewable woody biomass saved by the project activity is assessed based on ex post surveys of users and the areas from which this woody biomass is sourced. Subsequent to the clarification provided in sub paragraph (a) survey is not required for ex-post estimation of leakage in case B_{old} is multiplied by a net to gross adjustment factor of 0.95 to account for leakages.

Parameter	Data	Unit
B_{old}	1.469	Tonne fuel wood /cook stove/ year
$B_{y,\ savings}$	0.9774	Tonne fuel wood /cook stove/ year
$f_{NRB,y}$	87.90%	
$NCV_{biomass}$	0.015	TJ/tonne
$EF_{projectedfossilfuel}$	81.60	tCO_2e/TJ
$ER_{y,WGA,per\ cook\ stove}$ (Emission reduction/ cook stove /year without gross adjustment factor for B_{old} to account for leakage)	1.0515	tCO_2e /cook stove/ year

The leakage emission for ex-ante estimation of emission reduction is thereby calculated as a difference between the emission reduction estimated considering the actual value of Bold i.e. 1.469 Tonne fuel wood /cook stove/ year and emission reduction estimated by considering the value of Bold is estimated by multiplying Bold with a net to gross adjustment factor of 0.95.

For the purpose of ex-ante estimation of emission reduction, it is assumed that, only 90% of the cook stoves are operational in any point of time. Thus, the emission reduction per year

($ER_{y, WGA}$) without gross adjustment factor for B_{old} to account for leakage considering 90% of the cook stove as operational for the entire crediting period is 13,292 tCO_2e /year.

The Baseline Emissions achieved for this monitoring period is 62,612 tCO_2e /year.

The year wise efficiency of the improved cookstoves tested and considered for estimation of baseline emission is outlined in the table below

Third party assessment for monitoring period – 01-November-2012 to 31-October-2013			
Identification number	**Beneficiary name**	**District**	**Tested Efficiency**
GKEMPLPH-8-3747	Bandu Bhaurao Dalve	Sindhudurg	27.082%
GKEMPLPH-8-5277	Baliram Balasaheb Dudhate	Ratnagiri	27.087%
GKEMPLPH-8-13720	Bibishan Sudam Anbhule	Kolhapur	27.137%
GKEMPLPH-8-10774	Rajeshwar Ambadasrao Nagre	Kolhapur	27.192%
GKEMPLPH-8-11472	Bhagwan Aabasaheb Pawar	Kolhapur	27.420%
GKEMPLPH-8-4572	Arjun Rama Done	Ratnagiri	27.585%
GKEMPLPH-8-5988	Maruti Malu Waghmare	Ratnagiri	27.621%
GKEMPLPH-8-4725	Shivaji Dhondiba Kshirsagar	Ratnagiri	27.643%
GKEMPLPH-8-5564	Vaishali Badrinath Dhavan	Ratnagiri	27.722%
GKEMPLPH-8-6796	Chandrakant Siraram Pardesi	Ratnagiri	27.753%
GKEMPLPH-8-14038	Jagganath Yedba Bedke	Kolhapur	27.770%
GKEMPLPH-8-10594	Kesharbai Sunderrao Shikhare	Kolhapur	27.780%
GKEMPLPH-8-14004	Shamakumar Chhaganlal Shival	Kolhapur	27.841%
GKEMPLPH-8-5605	Popat Daridev Chavan	Ratnagiri	27.868%
GKEMPLPH-8-12924	Dnyandev Navnath Mahajan	Kolhapur	27.875%
GKEMPLPH-8-3979	Anant Devrao Shinde	Sindhudurg	27.878%
GKEMPLPH-8-2938	Prsad Dashrath Ambhore	Sindhudurg	27.931%
GKEMPLPH-8-12392	Vitthalrao Maruti Bhosale	Kolhapur	27.960%
GKEMPLPH-8-1010	Eknath Vishwnath Gholawe	Sindhudurg	27.977%
GKEMPLPH-8-10039	Sugandh Madhavrao Lendale	Kolhapur	27.984%
GKEMPLPH-8-5619	Tanaji Jagnath Bedke	Ratnagiri	27.996%
GKEMPLPH-8-528	Babarao Mahadev Dhakde	Sindhudurg	28.001%
GKEMPLPH-8-10120	Digambar Ramrao Korade	Kolhapur	28.137%
GKEMPLPH-8-11081	Vishnu Sahebrao Gate	Kolhapur	28.177%
GKEMPLPH-8-11320	Yashpal Ashroba Kakde	Kolhapur	28.186%
GKEMPLPH-8-4166	Asaram Sopanrao Harkal	Sindhudurg	28.206%
GKEMPLPH-8-6065	Sunil Tulshiram Jadhav	Ratnagiri	28.239%
GKEMPLPH-8-12099	Rajnandini Balasaheb Dhage	Kolhapur	28.287%
GKEMPLPH-8-1340	Parmeshwar Pandharinath Nirval	Sindhudurg	28.353%
GKEMPLPH-8-2323	Pandit Nivrutti Dhas	Sindhudurg	28.362%
GKEMPLPH-8-4862	Anurath Gamphu Dhane	Ratnagiri	28.476%
GKEMPLPH-8-4049	Mallikarjun Manoharrao Thore	Sindhudurg	28.505%
GKEMPLPH-8-6489	Namdev Dnyandev Gaikwad	Ratnagiri	28.509%
GKEMPLPH-8-1545	Sarswatibai Uttamrao Kadam	Sindhudurg	28.584%
GKEMPLPH-8-3344	Mahesh Madhavrao Giram	Sindhudurg	28.585%
GKEMPLPH-8-6126	Praveen Baburao Hole	Ratnagiri	28.655%
GKEMPLPH-8-292	Wankhade Mohan Devrao	Sindhudurg	28.837%
GKEMPLPH-8-7127	Nitin Kailas Devkar	Ratnagiri	28.888%
GKEMPLPH-8-3566	Nagorao Sonaji Pandhrkar	Sindhudurg	28.889%
GKEMPLPH-8-12773	Mohan Narayan Bhandwalkar	Kolhapur	29.386%

Third party assessment for monitoring period – 01-November-2013 to 31-October-2014

Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-8-4274	Narayan Keshavrao Kasbe	Sindhudurg	26.922%
GKEMPLPH-8-4401	Tompe Audumbar Vikram	Sindhudurg	26.922%
GKEMPLPH-8-3896	Jaishri Vishwanath Gangawane	Sindhudurg	26.989%
GKEMPLPH-8-10992	Shyam Shivajirao Chawhal	Kolhapur	27.018%
GKEMPLPH-8-12146	Rahul Rajabhau Yede	Kolhapur	27.053%
GKEMPLPH-8-11522	Narhari Dattrao Jadhav	Kolhapur	27.088%
GKEMPLPH-8-6511	Laxman Ganpati Pawar	Ratnagiri	27.118%
GKEMPLPH-8-10479	Amol Vitthalrao Sakhare	Kolhapur	27.119%
GKEMPLPH-8-2525	Manchak Sopanrao Yadav	Sindhudurg	27.132%
GKEMPLPH-8-6958	Vinod Shripati Ghadge	Ratnagiri	27.149%
GKEMPLPH-8-1919	Ankush Ginyanadev Dhole	Sindhudurg	27.206%
GKEMPLPH-8-910	Manik Uttamrao Dhole	Sindhudurg	27.221%
GKEMPLPH-8-5154	Godavari Hanuman Dube	Ratnagiri	27.223%
GKEMPLPH-8-10078	Janardhan Balasaheb Awargand	Kolhapur	27.252%
GKEMPLPH-8-10349	Govind Gangadhar Rudrwar	Kolhapur	27.288%
GKEMPLPH-8-4484	Vishnu Ganpatrao Shinde	Ratnagiri	27.303%
GKEMPLPH-8-7722	Chandrakant Popat Deshmukh	Ratnagiri	27.400%
GKEMPLPH-8-5279	Sheshabai Balasaheb Dudhate	Ratnagiri	27.408%
GKEMPLPH-8-6075	Sani Sudhkar Barkul	Ratnagiri	27.438%
GKEMPLPH-8-5815	Dhananjay Shrawan Sawant	Ratnagiri	27.489%
GKEMPLPH-8-11079	Dnyaneshwar Dhomdiram Gaikwad	Kolhapur	27.500%
GKEMPLPH-8-11213	Jagdish Ambadas Ghodke	Kolhapur	27.501%
GKEMPLPH-8-1849	Ashok Tulshiram Chavan	Sindhudurg	27.566%
GKEMPLPH-8-10061	Rameshwar Pandurangrao Awargand	Kolhapur	27.566%
GKEMPLPH-8-5785	Vitthal Raghunath Waghmare	Ratnagiri	27.617%
GKEMPLPH-8-12588	Mira Annasaheb Sabale	Kolhapur	27.632%
GKEMPLPH-8-12450	Mahadev Anata Lokare	Kolhapur	27.656%
GKEMPLPH-8-13408	Haridas Sopan Dongare	Kolhapur	27.664%
GKEMPLPH-8-10514	Ashroba Nathoba Lande	Kolhapur	27.712%
GKEMPLPH-8-8284	Bhalchandra Baban Bhagade	Ratnagiri	27.754%
GKEMPLPH-8-7753	Chandrakant Pandurang Doke	Ratnagiri	27.766%
GKEMPLPH-8-2295	Niwrti Manikrao Kachare	Sindhudurg	27.807%
GKEMPLPH-8-1698	Bhagwan Dagdoba Suravase	Sindhudurg	27.809%
GKEMPLPH-8-687	Wakode Shrikrushna Bansi	Sindhudurg	27.827%
GKEMPLPH-8-7946	Padmini Tanaji Hagavane	Ratnagiri	27.893%
GKEMPLPH-8-13564	Rahul Sampatti Randive	Kolhapur	27.977%
GKEMPLPH-8-2342	Jayram Parasram Barakhude	Sindhudurg	27.990%
GKEMPLPH-8-1155	Limbaji Panditrao Pondal	Sindhudurg	28.006%
GKEMPLPH-8-7845	Dada Sitaram Sonwane	Ratnagiri	28.072%
GKEMPLPH-8-1121	Rakmabai Ramesh Kale	Sindhudurg	28.299%

Third party assessment for monitoring period – 01-November-2014 to 31-October-2015			
Identification number	**Beneficiary name**	**District**	**Tested Efficiency**
GKEMPLPH-8-8694	Dhiraj Tanaji Salgar	Ratnagiri	26.706%
GKEMPLPH-8-3298	Yadoji Tolaji Bhmure	Sindhudurg	26.734%
GKEMPLPH-8-1558	Vishnu Radhakishan Warkhade	Sindhudurg	26.755%
GKEMPLPH-8-5351	Ganesh Shivajirao Kale	Ratnagiri	26.776%
GKEMPLPH-8-1612	Shantabai Ashok Deshmane	Sindhudurg	26.776%
GKEMPLPH-8-12361	Vinod Babasaheb Andhare	Kolhapur	26.805%
GKEMPLPH-8-12934	Anil Hanumant Barate	Kolhapur	26.808%

GKEMPLPH-8-1282	Digambar Vithalrao Kale	Sindhudurg	26.958%
GKEMPLPH-8-11674	Ranjana Bharat Rathod	Kolhapur	26.995%
GKEMPLPH-8-12371	Shesherao Limbraj Andhare	Kolhapur	26.999%
GKEMPLPH-8-13171	Dattatray Subhash Chavare	Kolhapur	27.029%
GKEMPLPH-8-2983	Jagannath Balaji Garud	Sindhudurg	27.051%
GKEMPLPH-8-7680	Sindhubai Mahadev Vaghmare	Ratnagiri	27.132%
GKEMPLPH-8-13272	Nitin Shivaji Adsul	Kolhapur	27.187%
GKEMPLPH-8-11666	Patloba Datrao Munde	Kolhapur	27.191%
GKEMPLPH-8-5639	Popat Babasaheb Ovhal	Ratnagiri	27.244%
GKEMPLPH-8-7929	Machindra Tukaram Ahohal	Ratnagiri	27.251%
GKEMPLPH-8-8699	Samadhan Vishwanath Devkar	Ratnagiri	27.289%
GKEMPLPH-8-13668	Vatsala Achyutrao Jadhav	Kolhapur	27.291%
GKEMPLPH-8-5939	Rajendra Pandhari Jadhav	Ratnagiri	27.314%
GKEMPLPH-8-5523	Maroti Sakharam Chandal	Ratnagiri	27.378%
GKEMPLPH-8-12229	Vinayak Ambadas Chavan	Kolhapur	27.411%
GKEMPLPH-8-2729	Vishnu Marotrao Bhaterao	Sindhudurg	27.433%
GKEMPLPH-8-7202	Rama Atmaram Khade	Ratnagiri	27.539%
GKEMPLPH-8-13847	Bhatat Bhagvat Sawant	Kolhapur	27.549%
GKEMPLPH-8-3776	Balasaheb Harishchandr Sukre	Sindhudurg	27.573%
GKEMPLPH-8-12858	Sumanbai Dattatray Kaladate	Kolhapur	27.584%
GKEMPLPH-8-2634	Bhagwan Munjaji Aalase	Sindhudurg	27.585%
GKEMPLPH-8-13022	Shrikrushna Chandrasen Kale	Kolhapur	27.656%
GKEMPLPH-8-5709	Chandrakala Dnyanoba Waghmare	Ratnagiri	27.681%
GKEMPLPH-8-6308	Dhananjay Ganapati Karbhari	Ratnagiri	27.712%
GKEMPLPH-8-10870	Ganesh Vijayrao Pawade	Kolhapur	27.729%
GKEMPLPH-8-1263	Sopan Naroji Thite	Sindhudurg	27.753%
GKEMPLPH-8-13003	Shahaji Dnyanoba Pawar	Kolhapur	27.797%
GKEMPLPH-8-1583	Ashamati Rajebhau Jadhav	Sindhudurg	27.830%
GKEMPLPH-8-7001	Dada Sadashiv Kasare	Ratnagiri	27.835%
GKEMPLPH-8-3522	Venkatesh Prakashrao Kure	Sindhudurg	27.891%
GKEMPLPH-8-1451	Ramrav Ravsaheb Mule	Sindhudurg	27.899%
GKEMPLPH-8-4560	Arjun Sahebrao Wakankar	Ratnagiri	27.979%
GKEMPLPH-8-4140	Dagadoba Chokhoba Paikrao	Sindhudurg	28.257%

Third party assessment for monitoring period – 01-November-2015 to 31-October-2016			
Identification number	**Beneficiary name**	**District**	**Tested Efficiency**
GKEMPLPH-8-11517	Pandurang Sopanrao Ghule	Kolhapur	26.028%
GKEMPLPH-8-6757	Amol Vilas Netke	Ratnagiri	26.068%
GKEMPLPH-8-1750	Ramdas Abasaheb Chokhat	Sindhudurg	26.102%
GKEMPLPH-8-131	Gajanan Bhimrao Ingle	Sindhudurg	26.124%
GKEMPLPH-8-579	Pandurang Vitthal Raut	Sindhudurg	26.191%
GKEMPLPH-8-7526	Lankabai Laxman Jadhav	Ratnagiri	26.251%
GKEMPLPH-8-2984	Prakashrao Rohidasrao Garud	Sindhudurg	26.303%
GKEMPLPH-8-7378	Tanaji Bappa Ghogare	Ratnagiri	26.323%
GKEMPLPH-8-5691	Mahadev Bhanudas Gaikwad	Ratnagiri	26.354%
GKEMPLPH-8-12038	Sharada Pradeep More	Kolhapur	26.390%
GKEMPLPH-8-7144	Taibai Balu Kale	Ratnagiri	26.441%
GKEMPLPH-8-2834	Kiran Vilasrao Kale	Sindhudurg	26.447%
GKEMPLPH-8-11629	Gayabai Shatrughuna Moti	Kolhapur	26.495%
GKEMPLPH-8-8575	Machindranath Kashinath Gaikwad	Ratnagiri	26.516%
GKEMPLPH-8-313	Savita Ravindra Gawai	Sindhudurg	26.685%

GKEMPLPH-8-2940	Vishwantath Dhondiram Bomble	Sindhudurg	26.705%
GKEMPLPH-8-3073	Gajanan Sopanrao Zade	Sindhudurg	26.751%
GKEMPLPH-8-4903	Gopinath Panditrao Shinde	Ratnagiri	26.826%
GKEMPLPH-8-10404	Digambar Keshavrao Kale	Kolhapur	26.830%
GKEMPLPH-8-6828	Dasharath Dagadu Shingade	Ratnagiri	26.874%
GKEMPLPH-8-11254	Trimbak Bapurao Gadekar	Kolhapur	26.907%
GKEMPLPH-8-3297	Gangadhar Shankarraoo Garud	Sindhudurg	26.942%
GKEMPLPH-8-1415	Sushila Yamaji Dolse	Sindhudurg	26.949%
GKEMPLPH-8-11026	Subhash Purshottam Mogal	Kolhapur	26.950%
GKEMPLPH-8-586	Haribhau Sukhdevrao Wardhe	Sindhudurg	26.962%
GKEMPLPH-8-6401	Sunita Vikram Ganage	Ratnagiri	26.963%
GKEMPLPH-8-12454	Laxmibai Gangadhar Pawar	Kolhapur	26.977%
GKEMPLPH-8-12085	Balaji Dattatray Gilbile	Kolhapur	27.013%
GKEMPLPH-8-12671	Shubham Dattatray Mohite	Kolhapur	27.043%
GKEMPLPH-8-10929	Vilas Subhashrao Kakde	Kolhapur	27.073%
GKEMPLPH-8-12792	Balasaheb Madan Satpute	Kolhapur	27.183%
GKEMPLPH-8-6857	Laxman Nandiram Salle	Ratnagiri	27.221%
GKEMPLPH-8-8248	Jotiram Narayan Jadhav	Ratnagiri	27.221%
GKEMPLPH-8-1507	Ushabai Radhakrushna Warkhade	Sindhudurg	27.287%
GKEMPLPH-8-10868	Iqbal Ahmed Modi	Kolhapur	27.362%
GKEMPLPH-8-13101	Sunita Uttamrao Pawar	Kolhapur	27.374%
GKEMPLPH-8-2958	Pandurang Madhavrao Shinde	Sindhudurg	27.376%
GKEMPLPH-8-8173	Datta Shrimant Jagdale	Ratnagiri	27.388%
GKEMPLPH-8-5226	Udhav Parsram Desai	Ratnagiri	27.427%
GKEMPLPH-8-12348	Sopan Bhika Gite	Kolhapur	27.552%

Third party assessment for monitoring period – 01-November-2016 to 31-October-2017			
Identification number	**Beneficiary name**	**District**	**Tested Efficiency**
GKEMPLPH-8-10917	Asaram Dagdoba Dalve	Kolhapur	26.009%
GKEMPLPH-8-12574	Chandrakant Vasant Shinde	Kolhapur	26.012%
GKEMPLPH-8-13160	Lalasaheb Mohanrao Yadav	Kolhapur	26.020%
GKEMPLPH-8-6953	Pandit Shivajirao Patil	Ratnagiri	26.030%
GKEMPLPH-8-10142	Baburao Narayan Dhone	Kolhapur	26.080%
GKEMPLPH-8-13981	Mahadev Limbraj Bhore	Kolhapur	26.083%
GKEMPLPH-8-13900	Somnath Dagdu Bhondave	Kolhapur	26.104%
GKEMPLPH-8-4644	Swapnil Shivajirao Naik	Ratnagiri	26.118%
GKEMPLPH-8-5339	Pratap Eknathrao Kale	Ratnagiri	26.130%
GKEMPLPH-8-5117	Madhav Kondiba Buchale	Ratnagiri	26.136%
GKEMPLPH-8-985	Raviraj Akatrao Jagtap	Sindhudurg	26.180%
GKEMPLPH-8-2187	Maroti Ganapatrao Karhale	Sindhudurg	26.185%
GKEMPLPH-8-2064	Dattatray Balasaheb Kadam	Sindhudurg	26.239%
GKEMPLPH-8-6544	Vishvanath Hari Shinde	Ratnagiri	26.270%
GKEMPLPH-8-11624	Sangeeta Deepak Shinde	Kolhapur	26.271%
GKEMPLPH-8-8374	Suhas Bharat Surwase	Ratnagiri	26.297%
GKEMPLPH-8-3041	Tukaram Mariba Vavale	Sindhudurg	26.321%
GKEMPLPH-8-5842	Suman Hanumant Tawale	Ratnagiri	26.383%
GKEMPLPH-8-4238	Ashwini Rajabhau Zute	Sindhudurg	26.431%
GKEMPLPH-8-11356	Aashamati Nana Sapate	Kolhapur	26.441%
GKEMPLPH-8-1080	Pandharinath Reva Rathod	Sindhudurg	26.456%
GKEMPLPH-8-5576	Meenabai Vinayak Shinde	Ratnagiri	26.506%
GKEMPLPH-8-5772	Shivaji Narayan Barate	Ratnagiri	26.542%
GKEMPLPH-8-12092	Yuvraj Rajendra Patil	Kolhapur	26.582%

GKEMPLPH-8-11314	Sangita Sarjerao Gadekar	Kolhapur	26.583%
GKEMPLPH-8-670	Mohod Dinesh Balkrishna	Sindhudurg	26.596%
GKEMPLPH-8-12573	Balaji Navnath Jagdale	Kolhapur	26.615%
GKEMPLPH-8-6480	Sujata Wasudev Bhuje	Ratnagiri	26.660%
GKEMPLPH-8-13426	Rambhau Tatyaba Dongare	Kolhapur	26.721%
GKEMPLPH-8-3053	Bhaskar Pralhadrao Chatte	Sindhudurg	26.726%
GKEMPLPH-8-6775	Dada Bira Masal	Ratnagiri	26.788%
GKEMPLPH-8-1630	Santosh Munja Mande	Sindhudurg	26.793%
GKEMPLPH-8-6611	Ankush Dharma Shinde	Ratnagiri	26.838%
GKEMPLPH-8-13292	Vikas Keshavrao Phatak	Kolhapur	26.869%
GKEMPLPH-8-12163	Niranjan Vishwanath Dhage	Kolhapur	26.904%
GKEMPLPH-8-5925	Usha Namdeo Katkure	Ratnagiri	27.003%
GKEMPLPH-8-2852	Rajendra Pandurang Kale	Sindhudurg	27.063%
GKEMPLPH-8-2003	Gangadhar Ratan Dhulagande	Sindhudurg	27.336%
GKEMPLPH-8-4237	Laxman Babasaheb Zute	Sindhudurg	27.439%
GKEMPLPH-8-1896	Sanajy Govindrao Jadahv	Sindhudurg	27.614%

5.2 Project Emissions

Project emissions are considered as zero for this project as no fossil fuels are used

5.3 Leakage

The leakage emission per cook stove is estimated as difference between the emission reduction estimated considering the actual value of Bold and emission reduction estimated considering the value of Bold obtained by multiplying Bold with a net to gross adjustment factor of 0.95.

Parameter	Data	Unit
Leakage emission	0.053	tCO_2e /cook stove/ year
Leakage emission due to use of traditional cook stove usage (assuming 0 for ex-ante)	0	tCO_2e /cook stove/ year
Leakage emission, (LEy, per cook stove)	0.053	tCO_2e /cook stove/ year

Therefore, the total leakage emission (LEy) for the project activity assuming 90% of 14,046 Nos. cook stove distributed is 665 tCO_2e /year (ex-ante).

The leakage emissions achieved for this monitoring period is 3,133 tCO_2e /year.

5.4 Net GHG Emission Reductions and Removals

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-November-2012 to 31-October-2013	12,873	0	644	12,229

01-November-2013 to 31-October-2014	12,731	0	637	12,094
01-November-2014 to 31-October-2015	12,496	0	625	11,871
01-November-2015 to 31-October-2016	12,387	0	620	11,767
01-November-2016 to 31-October-2017	12,125	0	607	11,518
Total	**62,612**	**0**	**3,133**	**59,479**

Comparison with the actual emission reductions achieved with the estimated emission reductions:

Duration	Net emission reduction for the project activity in the year y, ER_y	Estimated Emission Reductions	Comparison
01-November-2012 to 31-October-2017	**59,479**	**63,135**	**-6.00%**