Monitoring report form for CDM programme of activities (Version 02.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT

Title of the PoA	The Breathing Space Improved Cooking Stoves Programme, India	
UNFCCC reference number of the PoA	GS 916	
Version numbers of the PoA-DD applicable to this monitoring report	Version 5.2	
Version number of this monitoring report	Version 2.0	
Completion date of this monitoring report	30/04/2018	
Monitoring period number	3	
Duration of this monitoring period	01/08/2015 - 31/07/2017, Both days inclusive	
Monitoring report number for this monitoring period	01	
Coordinating/managing entity	Envirofit International	
Host Parties	Host Party of the PoA	Is this a host Party to a specific-case VPA covered in this monitoring report?(yes/no)
	India	Yes
Sectoral scopes	Sectoral Scope 3: Energy Demand	
Applied methodologies and standardized baselines	AMS II.G. - Energy efficiency measures in thermal applications of non-renewable biomass, version 03	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved after 1 January 2013
	0 tCO_2	**Year** / **Volume (tCO_2e)** 2015: 61,411 2016: 179,336 2017: 101,315 **Total: 342,062**
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	470,893 tCO_2e	

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

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The programme is a voluntary initiative taken by Envirofit International, a social enterprise, involving dissemination of improved efficiency cook-stoves (ICS) to domestic households in India. Envirofit is the coordinating/ managing entity (CME) for the programme.

Usage of non renewable biomass in traditional inefficient cookstoves, commonly referred as *chulhas*, results in decrease in carbon stock of the forests and equivalent GHG emissions as the carbon emission released from unsustainable tree cutting cannot be sequestered later. The ICS result in better heat transfer to the cooking pot and aids complete fuel combustion (avoiding smoke, black soot and Particulate matter) as compared to that achieved in traditional cook stoves. This results in a significant reduction in non-renewable biomass consumption and level of indoor air pollution (IAP) in project households. Therefore, ICS reduce greenhouse gas emissions equivalent to the reduced consumption of biomass fuel, by virtue of their higher efficiency compared to traditional/ baseline stoves. In the absence of project activity, the traditional inefficient cook stoves would have been used for cooking – producing substantial GHG emissions due to burning of non renewable biomass.

A.1.1. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Not applicable	Not applicable	Not applicable	Not applicable

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Crediting period type and duration[1]	Covered in this monitoring report? (yes/no)
1. "The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 01 Envirofit" – GS 1231	Not applicable	Version 5.2	10/07/2010 - 09/07/2020	Yes
2. "The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 02 Envirofit" – GS 1029	Not applicable	Version 5.2	10/07/2010 - 09/07/2020	Yes
3. "The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 03 Envirofit" – GS 1030	Not applicable	Version 5.2	10/07/2010 - 09/07/2020	Yes
4. "The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 04 Envirofit" – GS 1031	Not applicable	Version 5.2	10/07/2010 - 09/07/2020	Yes
5. "The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 05	Not applicable	Version 5.2	28/11/2012 - 27/11/2022	Yes

[1] The start date of crediting period of the VPAs is either the commissioning date of the VPA **OR** the date two years prior to the date of inclusion of VPA in the PoA (whichever is later of the two). VPA 01-04 were registered on 10 July 2012 and VPA 05-09 were included on 28 Nov 2014. VPA 10-13 were included on 16/08/2017. The commissioning date of each VPA is mentioned in section D.1 c) below. The start date of the crediting period has been calculated accordingly.

	Envirofit" – GS 3363				
6.	"The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 06 Envirofit" – GS 3364	Not applicable	Version 5.2	28/11/2012 - 27/11/2022	Yes
7.	"The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 07 Envirofit" – GS 3365	Not applicable	Version 5.2	28/11/2012 - 27/11/2022	Yes
8.	"The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 08 Envirofit" – GS 3366	Not applicable	Version 5.2	17/03/2013 - 16/03/2023	Yes
9.	"The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 09 Envirofit" – GS 3367	Not applicable	Version 5.2	30/09/2013 - 29/09/2023	Yes
10.	"The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 10 Envirofit" – GS 4291	Not applicable	Version 5.2	16/08/2015 - 15/08/2025	Yes
11.	"The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 11 Envirofit" – GS 5046	Not applicable	Version 5.2	22/09/2015 - 21/09/2025	Yes
12.	"The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 12 Envirofit" – GS 5417	Not applicable	Version 5.2	30/08/2016 - 29/08/2026	No
13.	"The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 13 Envirofit" – GS 5418	Not applicable	Version 5.2	01/02/2017 - 31/01/2027	No

A.2. Coordinating/managing entity

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Envirofit International Limited is the CME for the PoA.

The responsible persons for completing the CDM-PoA-MR-Form are as follows:

Nick Marshall
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Rohit Lohia
Carbon Projects Development Manager
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SECTION B. Implementation of PoA

B.1. Description of implemented PoA

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Provide information on how the validated management system was implemented in accordance with applicable provisions on the implementation of the management system in the Project Standard

Envirofit is the Coordinating and Managing Entity (CME) for the PoA. It is also the implementer for all VPAs included in the concerned monitoring period. Thus, all VPAs included in the monitoring report follow the same management system vis-à-vis:

(i) A record keeping system for each CPA under the PoA,

Envirofit maintains a sales database of stoves distributed in a VPA including the following information:

- Date of sale
- Model / type and Quantity of units
- Details of bulk purchasers (MFIs, SHGs, Corporates, NGOs etc.)

Besides, at the time of sale of cook-stove, the bulk purchaser, records, besides other information, the following details of the end user, as available:

- The name and address of the customer
- Contact Number of customer (if available)

- The ICS model and date of ICS purchase

The data is periodically received by CME from the bulk purchases. An end user database containing end user details of cook-stoves within the PoA is maintained[2] which is used for ex-post sampling and monitoring.

(ii) A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA,

To avoid inclusion of any stove which is a part of another registered Carbon project/ programme, all ICS under this programme bear the logo of Envirofit. This ensures that only stoves that are part of this programme are included in the PoA. Any double counting due to inclusion of any stove external to this programme is not possible. Besides each ICS unit also has a unique ID number / batch number inscribed on the stove to uniquely identify the ICS subsequently under the PoA/given VPA.

(iii) System/procedure for ex-post performance evaluation

Data on other ex-post parameters, including operational performance of ICS, continued usage of baseline stoves, etc are recorded objectively during sample surveys and field tests. For the current monitoring period, sampling was done at the PoA level (across multiple VPAs) using 95/05 as confidence / precision. Monitoring consisted of checking the representative samples against monitoring plan parameters using a questionnaire based survey and ICS performance field tests. The survey was conducted by Envirofit to collect feedback from sampled households. The data collected was transferred into excel sheet for analysis and calculation of emission reductions. For results of the sample based monitoring, refer VER calculation sheet. The CME is responsible for developing the Monitoring Report.

(iv) The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA

This is not applicable to the PoA currently. As per PoA-DD, this is applicable in case the VPA operator is other than CME. All the VPAs included in the PoA are operated by Envirofit which is also the CME.

B.2. Post-registration changes to PoA

B.2.1. Corrections

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NA

B.2.2. Inclusion of monitoring plan

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NA

B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

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NA

B.2.4. Changes to programme design

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NA

[2] the end user details is collected for as many end users as commensurate with representative sampling, i.e. it should not be less than 10 times the survey and field test sample sizes.

PART II Monitoring of CPAs

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The VPAs 01-11 have been sub-grouped into one and stratified random sampling across the population (stratified on the basis of model and age) has been applied.

SECTION C. Implementation of CPAs

C.1. Description of implemented CPAs

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(a) ***Purpose of the specific-case VPA(s) and the measures taken for GHG emission reductions or net GHG removals by sinks;***

All VPAs included in the monitoring report are identical in measure. All VPAs are small-scale VPAs and are implemented by Envirofit. All VPAs involve installation of domestic improved cooking stoves (ICS) in India. Usage of non renewable biomass in traditional inefficient cookstoves, commonly referred as chulhas, results in decrease in carbon stock of the forests and equivalent GHG emissions as the carbon emission released from unsustainable tree cutting cannot be sequestered later. The ICS result in better heat transfer to the cooking pot and aids complete fuel combustion (avoiding smoke, black soot and Particulate matter) as compared to that achieved in traditional cook stoves. This results in a significant reduction in non-renewable biomass consumption and level of indoor air pollution (IAP) in project households. Therefore, ICS reduce greenhouse gas emissions equivalent to the reduced consumption of biomass fuel, by virtue of their higher efficiency compared to traditional/ baseline stoves. In the absence of project activity, the traditional inefficient cook stoves would have been used for cooking – producing substantial GHG emissions due to burning of non renewable biomass.

(b) ***Description of the technology employed and installed equipment and/or infrastructure, including information requested by the eligibility criteria;***

Various models of improved cookstoves have been disseminated under the included VPAs. The following table gives the summary of installations covered under this monitoring period:

Summary of ICS that are covered in this monitoring period			
VPA number	**G3300**	**PCS1**	**Grand Total**
GS 1231 VPA 01			
GS 1029 VPA 02			
GS 1030 VPA 03			
GS 1031 VPA 04			
GS 3363 VPA 05	3943		3943
GS 3364 VPA 06	21517		21517
GS 3365 VPA 07	33332		33332
GS 3366 VPA 08	8180	24003	32183
GS 3367 VPA 09	3214	33666	36880
GS 4291 VPA 10		41015	41015
GS 5046 VPA 11		42443	42443
Grand Total	**70186**	**141127**	**211313**

Information requested by Eligibility criteria

Refer registered VPA-DD for detailed description of compliance with eligibility criteria for inclusion of a VPA in the PoA. The eligibility criteria # 1, 2, 8 and 9 relevant to the technology involved in the VPA, are discussed below:

Eligibility criteria #	Eligibility criteria requirements	Explanation for a typical VPA included in the PoA
1. Project Boundary.	The VPA shall involve the distribution of ICS within the geographical boundary of India	All the stoves included in the VPAs are within India and no stoves sold outside India are included in the emission reduction calculations. Please refer the Sales database for the same (Appended in ER calculator)
2. Methodology applicability criteria	Have a maximum energy saving of 180 GWhr/year.	This has been substantiated at the time of VPA inclusion. The VPAs include the

Eligibility criteria #	Eligibility criteria requirements	Explanation for a typical VPA included in the PoA
		models that have been already described in the VPA-DD. No new model other than those described in VPA-DDs has been sold / distributed. Lastly, the thermal energy savings achieved by each of the VPAs in each year under the monitoring period has been calculated and expressed in the "ER Summary" worksheet of VER calculation workbook. No VPA in any year is exceeding the methodology threshold.
2. Methodology applicability criteria	Each SSC VPA shall have a system to ensure that stoves bear logo of the PO /CME to ensure their unique association to the PoA	All ICS are provided with Envirofit Logo / product branding symbol as well as a unique serial number.
8. Intended User (Automatic additionality)	Each SSC VPA includes sale of improved cook stoves where the users of the improved cook stoves are households or communities or Small and Medium Enterprises (SMEs)	All the stove units distributed under the VPAs are domestic models only.
9. Size of individual unit (Automatic additionality)	The size of each Improved cook stove in the VPA shall not exceed 5% of the small-scale CDM threshold that is 9 GWhth energy savings per year	This has already been justified in the registered VPA-DDs. Also, the VPAs include much higher than 20 ICS units substantiating that thermal energy savings per annum per unit is much lower than 5% of methodology threshold (As at 5%, only 20 units will be eligible under the VPA).

(c) ***Relevant dates for the specific-case VPA(s) (e.g. construction, commissioning, continued operation periods, etc.);***

VPA	Commissioning date of VPA	Monitoring period
GS 1231 VPA 01	10 May 2008	01 Aug 2015 – 31 July 2017
GS 1029 VPA 02	31 May 2009	01 Aug 2015 – 31 July 2017
GS 1030 VPA 03	28 Feb 2010	01 Aug 2015 – 31 July 2017
GS 1031 VPA 04	30 Jun 2010	01 Aug 2015 – 31 July 2017
GS 3363 VPA 05	01 Nov 2010	01 Aug 2015 – 31 July 2017
GS 3364 VPA 06	01 Nov 2011	01 Aug 2015 – 31 July 2017
GS 3365 VPA 07	31 Aug 2012	01 Aug 2015 – 31 July 2017
GS 3366 VPA 08	17 Mar 2013	01 Aug 2015 – 31 July 2017
GS 3367 VPA 09	30 Sep 2013	01 Aug 2015 – 31 July 2017
GS 4291 VPA 10	05 May 2014	16 Aug 2015 – 31 July 2017
GS 5046 VPA 11	22 May 2015	22 Sep 2015 – 31 July 2017

The VPA is under continued operation post commissioning.

(d) ***Total GHG emission reductions or net GHG removals by sinks achieved in this monitoring period for the specific-case VPA(s), including information on how double counting is avoided***

The VPA 01-04 have not been included in the table as no stoves from VPA 01-04 are covered in the monitoring report[3]

ER summary PoA MP # 3					
Parameter		unit	Value		
Symbol	Description		2015	2016	2017
ER_y	Emission reduction achieved by the project activity for VPA05	tCO_2e	1414.0	3374.0	410.0
ER_y	Emission reduction achieved by the project activity for VPA06	tCO_2e	7718.0	18413.0	8532.0
ER_y	Emission reduction achieved by the project activity for VPA07	tCO_2e	11956.0	28523.0	16567.0
ER_y	Emission reduction achieved by the project activity for VPA08	tCO_2e	11544.0	27540.0	15996.0
ER_y	Emission reduction achieved by the project activity for VPA09	tCO_2e	13229.0	31559.0	18330.0
ER_y	Emission reduction achieved by the project activity for VPA10	tCO_2e	12636.0	35098.0	21095.0
ER_y	Emission reduction achieved by the project activity for VPA11	tCO_2e	2914.0	34829.0	20385.0
Total Emission	duction achieved by the PoA over MP # 2	tCO_2e	61411	179336	101315

C.2. Location of CPAs

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The VPAs are located within the boundary of India. Specifically, the VPAs are spread over the following states:

States	VPA05	VPA06	VPA07	VPA08	VPA09	VPA 10	VPA 11	Grand Total
Pondicherry		1						1
Meghalaya		3						3
Jharkhand			4					4
J & K		2	1		1	5		9
West Bengal	38		1			8	7	54
Delhi	2	50	14			2	1	69
Himachal Pradesh					100			100
Nagaland						209		209
Goa				284	1			285
Uttaranchal		200			105		700	1005
Manipur			2113	52		261		2426
Chhattisgarh						2456		2456
Assam		2	250	3	1995	420	220	2890
Andhra Pradesh	495	1469	104	450	4	4	406	2932
Uttar Pradesh		1		477	1297	1009	502	3286
Haryana		9	1		1	404	2950	3365
Bihar		100	1	3	200	100	3450	3854
Madhya Pradesh				195	36	4200	500	4931
Kerala		1	113	435	414	6134	524	7621
Odisha		2690	2		15	4014	2103	8824
Rajasthan	1	15	33	1482	2234	3041	3070	9876
Gujarat	358	958	2786	15455	1991	319	809	22676
Tamil Nadu	116	8392	4883	8548	14161	1061	2202	39363
Karnataka	2028	5113	955	587	6112	9287	21868	45950
Maharashtra	905	2511	22071	4212	8213	8081	3131	49124
Grand Total	**3943**	**21517**	**33332**	**32183**	**36880**	**41015**	**42443**	**211313**

Further, each VPA is mutually exclusive of the other by virtue of a time boundary within which sales in a given VPAs is restricted. The number of stoves in a VPA and the time during which they have been invoiced are unique for a VPA and serve as VPA unique identification.

[3] All stoves under VPA 01-03 either expired their design operation lifetime before the start of the monitoring period or were excluded fom monitoring due to very small volume.

C.3. Post-registration changes to CPAs

C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies or standardized baselines

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NA

C.3.2. Corrections

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NA

C.3.3. Changes to the start date of the crediting period

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NA

C.3.4. Inclusion of monitoring plan

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NA

C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

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NA

C.3.6. Changes to project design

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NA

SECTION D. Description of monitoring system of CPAs

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Stage 1: Sales records - At the time of Stove sales to distributers/ retailers, used for determination of N_{all} (population)

Data Generation and Aggregation: At the time of sale of an ICS unit to a stove bulk purchaser (MFIs, SHGs, Corporates, NGOs) a "Stove Purchase invoice" is executed between Envirofit and the purchaser.

Data Recording: These sales records includes the following information

- Name of the distributer / retailer,
- Batch number of stove,
- Number of units sold,
- Date of sale

Data Calculation and reporting: The Record is maintained with the Envirofit. The installation record are screened by Envirofit to eliminate any double counting of ICS or and/or incomplete, invalid entries.

Stage 2: End user database – Sampling frame

Data Generation and Aggregation: the bulk purchasers (MFIs, SHGs, Corporates, NGOs etc.) are encouraged to collect the end user details during the sales of stoves and transfer the information to Envirofit for compilation of end user database for sampling. At the time of sale of an ICS unit to a stove user, the end user information is collected and restored at the distributer level which includes:

- The name and address of the customer
- Contact Number of customer (if available)

- The model type and date of ICS purchase

Stage 3: Sampling Surveys and test – determine efficiency & SoF

Data Generation and Aggregation: On-site, ex-post tests and surveys have been conducted by Envirofit to determine η_{new}, SOF and discontinuation of displaced traditional cook stove on a sampling basis. Stratified random sampling was used. Random samples were picked from the sampling frame in accordance with the monitoring frequency (biennial) and confidence/margin of error (95/05) stated in monitoring plan. Water boiling test (WBT) to determine η_{new} and questionnaire survey to determine SOF and continued use of displaced traditional cook-stoves were carried out on the selected sample ICS. The on-field monitoring surveys and WBTs were managed by Envirofit in-house. Monitoring staff was hired for conducting surveys and also performing water boiling tests for sampled users to expedite completion of the monitoring phase.

Data Recording: The results from the WBTs and the sampling survey were recorded by the site technicians / surveyors in the template provided by Envirofit (Appendix 2 and 3) to site technicians/ surveyors. The same were taken back from them post monitoring surveys and were converted to electronic format by Envirofit for the purpose of ER calculations. The hardcopy reports are archived at Envirofit head-office.

Data Calculation and reporting: Envirofit assessed the compliance of the sampling results for 95% confidence and 5% precision (margin of error) as required in case of biennial monitoring as per registered monitoring plan. For results of the monitoring and emission reduction calculations refer ER calculator.

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

(Copy this table for each data or parameter)

Data/parameter	$Q_{biomass}$
Unit	Tonnes/ year
Description	Annual average biomass consumption per appliance in absence of project activity
Source of data	Envirofit brochures, registered PoA-DD
Value(s) applied	1.915
Choice of data or measurement methods and procedures	registered PoA/VPA-DDs
Purpose of data	Baseline emission calculations
Additional comments	Fixed for the entire crediting period

Data/parameter	$EF_{projected\_fossil\ fuel}$
Unit	tCO_2/TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers.
Source of data	AMS-II. G version 03, page 2
Value(s) applied	81.6
Choice of data or measurement methods and procedures	Default value as prescribed by methodology applied
Purpose of data	Baseline calculations
Additional comments	

Data/parameter	η_{old}
Unit	Fraction
Description	Efficiency of the system being replaced
Source of data	AMS-II. G version 03
Value(s) applied	0.1
Choice of data or measurement methods and procedures	Default value as prescribed by methodology applied
Purpose of data	Baseline calculations
Additional comments	

Data/parameter	**LAF**
Unit	Fraction
Description	Leakage adjustment factor
Source of data	AMS-II. G version 03
Value(s) applied	0.95
Choice of data or measurement methods and procedures	Default value as prescribed by methodology applied
Purpose of data	Calculation of leakage
Additional comments	

Data/parameter	$NCV_{biomass}$
Unit	TJ/tonne
Description	Net Calorific Value of the non –renewable woody biomass that is substituted
Source of data	AMS – II. G ver 03, page 2
Value(s) applied	0.015
Choice of data or measurement methods and procedures	Default value as prescribed by methodology applied
Purpose of data	Baseline calculations
Additional comments	

Data/parameter	$\mathbf{f_{NRB,y}}$
Unit	Fraction
Description	Fraction of biomass in year y that can be established as non renewable using survey methods

Source of data	Global Forest Resources Assessment 2010, Country Report for India (FAO), registered PoA-DD
Value(s) applied	0.8965
Choice of data or measurement methods and procedures	registered PoA/VPA-DDs, ER calculator
Purpose of data	Baseline emission calculations
Additional comments	The statewise values of fNRB have been fixed ex-ante in the PoA-DD. The fNRB value has been updated based on statewise distribution of sales

E.2. Data and parameters monitored

Data/parameter	η_{new}
Unit	Fraction
Description	Efficiency of the system being deployed as part of the project activity
Measured/calculated/ default	Measured and calculated
Source of data	Water boiling test results from on field tests
Value(s) of monitored parameter	(see table below)
Monitoring equipment	The CME/PO conducts Water Boiling Tests with the help of trained personnel, equipments used are thermometers, weigh scales and wood moisture content meters.
Measuring/reading/ recording frequency	Annual
Calculation method (if applicable)	Refer the ER workbook for calculation method
QA/QC procedures	In case where survey results indicate that desired precision is not achieved, the lower bound of confidence interval of the parameter value would be used. All data required for verification and issuance will be backed-up and kept for at least two years after the end of the crediting period or the last issuance of CERs of this project, whichever occurs later.
Purpose of data	Baseline calculations
Additional comments	

Year	**Stove Model**	**Stoves considered for ER calculations**	**WBTs conducted**	**Monitored Mean efficiency (%)**
2012	**G3300**	27371	3	21.93%
2013	**G3300**	39571	4	22.48%
2014	**G3300**	3244	1	22.80%
2013	**PCS1**	22340	2	22.73%
2014	**PCS1**	43478	4	23.28%
2015	**PCS1**	61496	6	23.86%
2016	**PCS1**	13813	3	24.33%
Total		**211313**	**23**	**23.13%**

Data/parameter	N_{all}
Unit	Number
Description	Total Number of stoves credited in year y
Measured/calculated/ default	Envirofit sales records
Source of data	Monitored

Value(s) of monitored parameter	<table><tr><th>Year</th><th>Stove Model</th><th>Stoves considered for ER calculations</th></tr><tr><td>2012</td><td>G3300</td><td>27371</td></tr><tr><td>2013</td><td>G3300</td><td>39571</td></tr><tr><td>2014</td><td>G3300</td><td>3244</td></tr><tr><td>2013</td><td>PCS1</td><td>22340</td></tr><tr><td>2014</td><td>PCS1</td><td>43478</td></tr><tr><td>2015</td><td>PCS1</td><td>61496</td></tr><tr><td>2016</td><td>PCS1</td><td>13813</td></tr><tr><td colspan="2">Total</td><td>211313</td></tr></table>
Monitoring equipment	Not applicable
Measuring/reading/ recording frequency	Continuous
Calculation method (if applicable)	--
QA/QC procedures	--
Purpose of data	Baseline calculations
Additional comments	Sales records containing details of all the cook-stoves sold to bulk purchasers like dealers, distributors, retailers and NGOs within a particular SSC VPA is maintained.

Data/parameter	**SOF**
Unit	Fraction
Description	Stove Operation Fraction - To determine only stoves that are still operating, measured ex-post through survey
Measured/calculated/ default	Survey
Source of data	Survey results
Value(s) of monitored parameter	<table><tr><th>Year</th><th>Stove Model</th><th>Surveys conducted</th><th>Monitored SoF</th></tr><tr><td>2012</td><td>G3300</td><td>36.00</td><td>0.694</td></tr><tr><td>2013</td><td>G3300</td><td>51.00</td><td>0.765</td></tr><tr><td>2014</td><td>G3300</td><td>5.00</td><td>0.800</td></tr><tr><td>2013</td><td>PCS1</td><td>39.00</td><td>0.744</td></tr><tr><td>2014</td><td>PCS1</td><td>49.00</td><td>0.837</td></tr><tr><td>2015</td><td>PCS1</td><td>66.00</td><td>0.879</td></tr><tr><td>2016</td><td>PCS1</td><td>38.00</td><td>0.921</td></tr><tr><td colspan="2">Total</td><td>284.00</td><td>0.812</td></tr></table>
Monitoring equipment	Not applicable
Measuring/reading/ recording frequency	Annual
Calculation method (if applicable)	SoF is the average fraction of stoves found operating in a VPA
QA/QC procedures	In case where survey results indicate that desired precision is not achieved, the lower bound of confidence interval of the parameter value would be used. All data required for verification and issuance will be backed-up and kept for at least two years after the end of the crediting period or the last issuance of CERs of this project, whichever occurs later.
Purpose of data	Baseline calculations
Additional comments	

Data/parameter	Disposal/Discontinuation of traditional cookstove
Unit	Fraction
Description	Extent of continued usage of traditional stoves along with ICS
Measured/calculated/ default	Survey

Source of data	Survey records
Value(s) of monitored parameter	0.127
Monitoring equipment	Not applicable
Measuring/reading/ recording frequency	Annual
Calculation method (if applicable)	The sampled ICS households were cross checked for disposal / discontinuation of traditional cook-stove. If the sampled user was found using traditional stove along with ICS, the number of meals cooked on traditional cookstove and number of meals cooked on ICS were recorded to determine the extent of continued usage of baseline stoves The fuel-wood consumption $Q_{biomass}$ has been adjusted accordingly.
QA/QC procedures	--
Purpose of data	Baseline Calculations
Additional comments	

Sustainable development indicators

Data/parameter	Air Quality
Unit	Qualitative
Description	Reduction in smoke or Particulate Matter (PM)
Measured/calculated/ default	Survey
Source of data	Survey records
Value(s) of monitored parameter	231 respondents (out of 231 samples found using the ICS) mentioned reduction in smoke and soot while cooking with project ICS
Monitoring equipment	Not applicable
Measuring/reading/ recording frequency	Annual
Calculation method (if applicable)	Not applicable
QA/QC procedures	--
Purpose of data	Sustainable development assessment
Additional comments	

Data/parameter	Access to affordable and clean energy services (Retroactive VPA)
Unit	Qualitative
Description	Feedback from end users regarding problems with stove design/ usability
Measured/calculated/ default	Survey
Source of data	Survey Records
Value(s) of monitored parameter	No negative comments were received. All 231 users reporting using ICS mentioned they were happy with the performance of ICS.
Monitoring equipment	Not applicable
Measuring/reading/ recording frequency	Annual
Calculation method (if applicable)	Not applicable
QA/QC procedures	--
Purpose of data	Sustainable development assessment
Additional comments	

Data/parameter	Quantitative employment and income generation
Unit	Number
Description	No of Jobs created due to the project activity
Measured/calculated/ default	Measured
Source of data	HR records/ Sales and marketing records

Value(s) of monitored parameter	<table><tr><th>Description</th><th>2015</th><th>2016</th><th>2017</th></tr><tr><td>Employees on payroll</td><td>23</td><td>25</td><td>25</td></tr></table>
Monitoring equipment	Not applicable
Measuring/reading/ recording frequency	Annual
Calculation method (if applicable)	Not applicable
QA/QC procedures	--
Purpose of data	Sustainable development assessment
Additional comments	

E.3. Implementation of sampling plan

>>

a) Description of implemented single sampling design;

- **Objectives and reliability requirements:** Sampling done at the VPA level, using 95/05 as confidence / precision.
- **Sampling Schedule:** Usage survey on the sampled cookstoves was conducted during December 2017 – January 2018.
- **Target Population/ Sampling Frame:** The Target population is the stoves distributed under the VPAs 01 - 11. The end user database of the stoves distirbuted under the VPAs serve as the sampling frame.
- **Sampling Method:** As per the sampling plan, sampling is based on stratified sampling approach (based on age and stove model type). The samples are chosen randomly with each stratum. Samples were selected using online tool i.e. Stattrek random number[4] generator after categorising the target population as per stove model and age.
- **Sampling Size:** Determination of the sample size is elucidated in the VER calculation workbook.

The sampling parameters of interest are the following:

a) Efficiency of cook-stove
b) Stove usage Characteristics (operational fraction, discontinued use of baseline stove etc)

As these parameters are likely affected by the age and model type of a stove hence, stratified random sampling approach has been used. The stove sales have been categorized on the basis of year of sale (to account for age) and the model type for each year of sale. Thereafter, the expected mean efficiency, standard deviation to mean and expected operational fraction are estimated to determine sample size for each strata. Taking these estimated values into consideration along with their weight (% share in total sales), the sample size for the population is calculated using the following formulae:

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

Where,

n	Sample size
z	Confidence value factor = 1.645 for 90% confidence level
N	Population size
V	Sampling variable

[4] http://stattrek.com/statistics/random-number-generator.aspx

e Relative precision = 0.10

Where V is calculated as follows

(1) For mean based parameters

$$V = \frac{SD^2}{mean^2}$$

Where,

$$mean = \frac{\sum g_i \times m_i}{N}$$

$$SD^2 = \frac{\sum g_i \times SD_i^2}{N}$$

Where

mean weighted overall mean
SD^2 Weighted Overall Standard deviation
g_i Size of stratum *i*
m_i Mean of stratum *i*
SD_i^2 Standard deviation of stratum *i*
N Size of overall population

(1) For proportion based parameters

$$V = \frac{SD^2}{p^2}$$

Where,

$$p = \frac{\sum g_i \times p_i}{N}$$

$$SD^2 = \frac{\sum g_i \times p_i \times (1 - p_i)}{N}$$

Where

p Overall weighted proportion
p_i Proportion of stratum *i*

SamplLng Constants	Values
Monitoring period start 2015	1-Aug-15
Monitoring period end 2015	31-Jul-17
Monitoring frequency (years)	2.00
Level of Sampling	PoA
Confidence (%) (90 or 95)	95%
Margin of Error (%)	5%
Z value	1.960

Estimated results based sample size determination		
Estimated efficiency (mean)		23.20
estimated variance of efficiency (SD)		2.32
$V_{mean} = (SD/mean)^2$		0.01
Minimum Sample Size required (efficiency)		16
tDistribution sample size adjustment	Iteration 1	19
	Iteration 2	18
	Iteration 3	18
	Iteration 4	18
Estimated SOF (p)		0.869
Estimated variance of SOF (SD)		0.326
$V_{SOF} = (SD/p)^2$		0.141
minimum Sample Size required (SOF)		216

Year	Stove Model	Stoves considered for ER caiculations	Estimated Efficiency (%)	Efficiency Sample size required	Estimated SoF	Survey Samples required
2012	G3300	27371	22.00	3	0.75	29.00
2013	G3300	39571	23.00	4	0.80	41.00
2014	G3300	3244	24.00	1	0.85	4.00
2013	PCS1	22340	22.00	2	0.875	23.00
2014	PCS1	43478	23.00	4	0.900	45.00
2015	PCS1	61496	24.00	6	0.925	63.00
2016	PCS1	13813	25.00	2	0.950	15.00
	Total	211313	23.20	22	0.869	220.00

The sample size calculated is then distributed amongst the strata as per the weight of each stratum in the population and rounded up to the nearest higher integer to obtain the sample size required for the strata. Once sample size for each stratum has been calculated, samples were selected at random from the end-user database. The number of samples selected from each stratum was kept slightly higher to account for non-response cases and ensure desired precision is achieved. These identified samples were distributed amongst the field team to gather response.

c) Collected data (electronic spreadsheets may be attached and referenced);

Refer Appendix 1 for the WBT test observation record sheet. Appendix 2 details the monitoring questionnaire that was used to collect the monitoring data. The data collected on the sampled stoves is presented in the sheet titled "Usage Survey Summary" and "WBT Summary" respectively in the VER Calculation workbook.

d) Analysis of the collected data;

Analysis of the data monitored through sampling revealed the following results:

Year	Stove Model	Stoves considered for ER caiculations	Sampling Frame Size	WBTs conducted	Monitored Mean efficiency (%)	Surveys conducted	Monitored SoF
2012	G3300	27371	653	3	21.93%	36.00	0.694
2013	G3300	39571	692	4	22.48%	51.00	0.765
2014	G3300	3244	59	1	22.80%	5.00	0.800
2013	PCS1	22340	919	2	22.73%	39.00	0.744
2014	PCS1	43478	3062	4	23.28%	49.00	0.837
2015	PCS1	61496	20480	6	23.86%	66.00	0.879
2016	PCS1	13813	108	3	24.33%	38.00	0.921
	Total	211313	25973	23	23.13%	284.00	0.812

e) ***Demonstration of whether the required confidence/precision has been met***;

Refer above. The VER calculation spreadsheet contains calculation of relative precision. Since the relative margin of error obtained is less than 05%, the data are statistically acceptable and deemed representative of the population.

Monitoring results and Reliability Check - Efficiency	
Sample size	23
Mean Efficiency	23.13%
Std Dev of efficiency	0.24%
Standard error of mean	0.05%
Relative precision (Margin of error)	0.10%
Result	Ok, passed
Lower Bound confidence value	Not applicable

Monitoring results and Reliability Check - SoF	
Sample size	284
SOF measured	0.812
Standard Error of SoF	0.023
relative precision	4.52%
Result	Ok passed

f) ***Demonstration of whether the samples were randomly selected and are representative of the population.***

The sales data of each stratum was arranged in the order of date in excel, with serial numbers assigned to each sale. Random numbers were generated using the online random number generator available at stattrek random number generator[5] for each stratum as per the minimum sample size requirements. The samples with same serial number as those generated by random number were selected for monitoring. Thus, the samples indentified are purely random.

SECTION F. Calculation of emission reductions or net anthropogenic removals

F.1. Calculation of baseline emissions or baseline net removals

>>

The methodology directly provides equation for emission reductions (without separate baseline, project or leakage emission reduction equations)

Following, para 7(a) and 13(a) of the methodology and section B.5.2, B_{old} is calculated as follows:

$$B_{old} = Q_{biomass} * \sum_{i=1}^{Nall} (Stove\ year_i) * SOF$$

Where,

B_{old}	Quantity of woody biomass used in the absence of project activity (tonnes)
$Q_{biomass}$	Average annual biomass consumption per appliance (tonnes/ year)
SOF	Stove Operation Fraction (% of stoves operating or replaced by equivalent in-service appliance) – measured ex post using survey/ user feedback .
Stove year *i*	Calculated cumulative stove operation years in the monitoring period in year *i* for stove in the monitoring period
N_{all}	Total number of ICS Distirbuted under the VPA (number)

Thus,

[5] http://stattrek.com/statistics/random-number-generator.aspx

$B_{y,savings}$ is estimated using option 2, equation 3 of the methodology AMS-II.G version 3.

$B_{y,savings} = B_{old} (1-\eta_{old}/ \eta_{new})$

Where

η_{old}	Efficiency of the system being replaced
η_{new}	Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol. Use weighted average values if more than one type of system is being introduced by the project activity

Thus, $ER_y = B_{y,savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel} * LAF$

Where:

ER_y	Emission reductions during the year y in tCO_2e
$B_{y,savings}$	Quantity of biomass that is saved in tonnes
$f_{NRB,y}$	Fraction of biomass saved by the project activity in year y that can be established as non renewable biomass using survey methods
$NCV_{biomass}$	Net calorific value of the non-renewable biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossilfuel}$	Emission factor for the substitution of non-renewable biomass by similar Consumers (Use a value of 81.6tCO_2/TJ)
LAF	Net to gross Adjustment factor (0.95) applied in accordance with paragraph 13 and 23 of AMS-II. G version 03

As explained above, the methodology directly provides equation for emission reductions; without separate baseline, project or leakage emission reduction equations. Thus, the table below gives a summary of calculation of GHG emission reductions:

ER summary PoA MP # 3						
Parameter		unit	Value			
Symbol	Description		2015	2016	2017	Total
ER_y	Emission reduction achieved by the project activity for VPA05	tCO_2e	1414.0	3374.0	410.0	5198.0
ER_y	Emission reduction achieved by the project activity for VPA06	tCO_2e	7718.0	18413.0	8532.0	34663.0
ER_y	Emission reduction achieved by the project activity for VPA07	tCO_2e	11956.0	28523.0	16567.0	57046.0
ER_y	Emission reduction achieved by the project activity for VPA08	tCO_2e	11544.0	27540.0	15996.0	55080.0
ER_y	Emission reduction achieved by the project activity for VPA09	tCO_2e	13229.0	31559.0	18330.0	63118.0
ER_y	Emission reduction achieved by the project activity for VPA10	tCO_2e	12636.0	35098.0	21095.0	68829.0
ER_y	Emission reduction achieved by the project activity for VPA11	tCO_2e	2914.0	34829.0	20385.0	58128.0
Total Emission reduction achieved by the PoA over MP # 3		**tCO_2e**	**61411**	**179336**	**101315**	**342062**

F.2. Calculation of project emissions or actual net removals

>>

Not applicable

F.3. Calculation of leakage emissions

>>

Not applicable

F.4. Calculation of emission reductions or net anthropogenic removals

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)			
				2015	2016	2017	Total amount
GS 3363 VPA 05	5198	0	0	1414	3374	410	5198
GS 3364 VPA 06	34663	0	0	7718	18413	8532	34663

GS 3365 VPA 07	57046	0	0	11956	28523	16567	57046
GS 3366 VPA 08	55080	0	0	11544	27540	15996	55080
GS 3367 VPA 09	63118	0	0	13229	31559	18330	63118
GS 4291 VPA 10	68829	0	0	12636	35098	21095	68829
GS 5046 VPA 11	58128	0	0	2914	34829	20385	58128
Total	**342062**	**0**	**0**	**61441**	**179336**	**101035**	**342062**

F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs

Parameter		unit	PDD ESTIMATES for Monitoring Period				ACTUAL ERs ACHIEVED			
Description	**Symbol**		**2015**	**2016**	**2017**	**Total**	**2015**	**2016**	**2017**	**Total**
VPA05	ER_y	tCO_2e	8254	14223	339	22816	1414	3374	410	5198
VPA06	ER_y	tCO_2e	16441	26162	8053	50656	7718	18413	8532	34663
VPA07	ER_y	tCO_2e	18353	40919	23115	82386	11956	28523	16567	57046
VPA08	ER_y	tCO_2e	18565	43976	24156	86696	11544	27540	15996	55080
VPA09	ER_y	tCO2e	17686	42446	23065	83197	13229	31559	18330	63118
VPA10	ER_y	tCO2e	10433	41447	24177	76057	12636	35098	21095	68829
VPA11	ER_y	tCO2e	1550	42005	25530	69085	2914	34829	20385	58128
Total Emission reductions		**tCO_2e**	**91280**	**251178**	**128435**	**470893**	**61411**	**179336**	**101315**	**342062**

F.6. Remarks on increase in achieved emission reductions

>>

Not applicable

Appendix 1: WBT Observation Record Sheet

GS 916: The Breathing Space Improved Cooking Stoves Programme, India
GS5417: The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 12 Envirofit

Water Boiling Test - General Information - page 1

Test & stove description

Name of Tester(s) .....
Test Number or Code .....
Date .....
Test Location .....

Stove Type/Model | PCS -1 |

Ambient conditions

Air temperature (C) .....
Wind Conditions .....
Local Boiling Point (C) .....

Fuel Characteristics

Fuel Type .....
Average Length (cm) .....
Cross-Section Dimension (cmXcm) .....

Fuel Moisture Content

	Instrument reading (% Dry basis) 1	2	3
Piece 1			
Piece 2			
Piece 3			

Weight of containers

Dry weight of Pot (grams) .....
Weight of Fuel Container (grams) .....
Weight of Char container (grams) .....

GS 916: The Breathing Space Improved Cooking Stoves Programme, India
GS5417: The Breathing Space Improved Cooking Stoves Programme, India – VPA No. 12 Envirofit

Water Boiling Test - Observations - page 2

Measurements Description	Units	Cold Start Start	Cold Start End
Time	hr:min		
Weight of wood + fuel container	grams		
Water Temperature in Pot	ºC		
Weight of Pot with water	grams		
Weight of Charcoal + Char container	grams		
Fire Starting Materials	grams		

Measurements Description	Units	Hot Start Start	Hot Start End
Time	hr:min		
Weight of wood + fuel container	grams		
Water Temperature in Pot	ºC		
Weight of Pot with water	grams		
Weight of Charcoal + Char container	grams		
Fire Starting Materials	grams		

Appendix 2: Usuage Survey Questionnaire template

GS 916: The Breathing Space Improved Cooking Stoves Programme, India
GS 5417: The Breathing Space Improved Cooking Stoves Programme, India – VPA no. 12 Envirofit

Monitoring Survey Questionnaire

Question	Response			
1. Date of Survey	D D - M M M - Y Y Y Y			
2. Name of Surveyor / Agency				
3. Beneficiary ID				
4. Name of User / Respondent				
5. Address of the User / Respondent				
6. Contact Details of User / Respondent (phone number) if available				
7. Number of Members in the household	Number of Adults		Number of Children	
8. Envirofit Stove Batch / Serial number				
9. Date of Distribution of PCS-1	D D - M M M - Y Y Y Y			
10. Is PCS-1 present in the household?	**Yes**		**No**	
11. What is the physical condition of PCS-1	Very Good	Good	Satisfactoy	Poor / damaged
If answer to 10) is "Yes" go to 11). If answer to 10) is "No" stop the survey.				
12. Do you use PCS-1 for cooking?	**Yes**		**No**	
If answer to 12) is "Yes" jump to 14). If answer to 12) is "No" answer 13) and stop the survey				
13. If No, what is the date of discontinuation of usage?	D D - M M M - Y Y Y Y			
14. Is there less smoke in your kitchen when cooking with PCS-1 compared to Traditional stove?	**Yes**		**No**	
15. Is there less soot on the utensils when you cook with PCS-1	**Yes**		**No**	
16. Does the PCS-1 uses less fuel while cooking as compared to traditional stoves	**Yes**		**No**	
17. If you collect fuel do you spend less time in collecting fuel now as compared to earlier	**Yes**		**No**	
18. If you purchase fuel do you spend less money on buying fuel now as compared to earlier	**Yes**		**No**	
19. Are you happy with the performance of PCS–1 stove	**Yes**		**No**	
20. Any other comment / Feedback on PCS-1 design / usability / after sales service / warranty				
21. Any other improved biomass stove in the house	**Yes**		**No**	
22. Record manufacturer and make of other improved biomass stove				
23. Is any Traditional Stove present along with PCS-1?	**Yes**		**No**	
If answer to 23) is "Yes" go to 24). If answer to 23) is "No" stop the survey.				
24. If yes, do you use the Traditional Stove for cooking?	**Yes**		**No**	
If answer to 24) is "Yes" go to 25). If answer to 24) is "No" stop the survey.				
25. If yes, how many meals do you cook on these stoves daily?	Record Number of meals cooked on PCS-1		Record Number of meals cooked on Traditional stove	
Survey Complete, thanks				

- - - - -

Document information

Version	*Date*	*Description*
02.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for programmes of activities (CDM-EB93-A07-STAN); • Make editorial improvements.
01.0	1 April 2015	Initial publication.

Decision Class: Regulatory
Document Type: Form
Business Function: Issuance
Keywords: monitoring report, programme of activities