Programme design document form for small-scale CDM programmes of activities

(Version 03.0)

Complete this form in accordance with the Attachment "Instructions for filling out the programme design document form for small-scale CDM programmes of activities" at the end of this form.

PROGRAMME DESIGN DOCUMENT (PoA-DD)	
Title of the PoA	Biomass Energy Conservation Programme
Version number of the PoA-DD	07
Completion date of the PoA-DD	07/07/2015
Coordinating/ managing entity	Hestian Innovation Ltd.
Host Party(ies)	Republic of Malawi and Republic of Rwanda
Sectoral scope(s) and selected methodology(ies), and where applicable, selected standardized baseline(s)	Sectoral Scope 3 : Energy Demand Selected Methodology: AMS-II.G. (Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass) Version 06.

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

Biomass Energy Conservation Programme
Version 7
07/07/2015

A.2. Purpose and general description of the PoA

The Biomass Energy Conservation (BEC) POA is a voluntary initiative by Hestian Innovation Ltd. (Hestian) which aims to promote sustainable development and the reduction of greenhouse gas emissions from non-renewable biomass fuel through dissemination of improved household cookstoves in Malawi and Rwanda. Each CPA will consist of a number of improved cookstoves (ICS), such as the Chitetezo Mbaula or Canarumwe stoves, or others as specified in each CPA-DD.

Both Malawi and Rwanda are Least Developed Countries (LDCs) where biomass in the form of firewood, charcoal and crop waste meets 93%[1] and 99.2%[2], respectively, of household and industrial energy needs.

In Malawi, current solid biomass supply does not adequately meet demand. Further, Malawi is vulnerable to other challenges that affect its energy sector such as low purchasing power, adverse impacts of Household Air Pollution on women and children, and land degradation caused by overharvesting of wood.

The use of efficient stoves is one of the key components of Malawi's Biomass Energy Strategy; and the positive effects of the use of improved cookstoves on the physical environment and economy of Malawi contribute to the realisation of goals and objectives outlined in Malawi's Poverty Reduction Strategy Paper; Growth and Development Strategy; Biodiversity Strategy and Action Plan; and the National Environmental Policy. In addition, in mid-2012 Malawi signed on as a national partner to the Global Alliance for Clean Cookstoves and on January 10, 2013, the Government of Malawi represented by then President, Joyce Banda, announced a target of 2 million clean and efficient cookstoves in the country by 2020.

In Rwanda, the use of efficient stoves is one of the main elements on which the biomass energy strategy is based; and the promotion, dissemination and adoption of efficient stoves is embraced throughout the national objectives outlined in Rwanda's National Energy Policy and Strategy (2008-2012) and its aim to have 100% of households using an improved stove. The Strategy encourages private sector participation in the energy sector through distribution of household-level energy systems, including efficient and safe wood and charcoal stoves and energy efficiency initiatives.[3]

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[1] In Malawi, wood (biomass) is the dominant household fuel accounting for 98% in rural and 53% in urban areas on average. Rural areas tend to be more dependent on wood, and urban areas on charcoal. (*Source: Millennium Challenge Corporation Report 2010, cited in Malawi State of Environment and Outlook Report 2010*).

[2] In Rwanda, wood (biomass) is the dominant household fuel accounting for 93% in rural and 45% in urban areas. Charcoal accounts for 50% in all urban areas combined and for 65% in the capital Kigali (Source: Third Integrated Household Living Conditions Survey EICV 3, 2010/2011, Table 3.2.1, Page 66). Of the households targeted in Rwanda BECP, 100% use biomass as their primary fuel source (based on Rwanda Baseline Study).

[3] Republic of Rwanda National Energy Policy and National Energy Strategy 2008 -2012, Section 2.3.8, Pg. 7.

The Rwandan government acknowledges the current and future importance of biomass fuels, particularly woodfuel and charcoal, as accessible and affordable sources of energy for the majority of the Rwandan population, and therefore supports improved technologies that increase the efficiency in burning biomass.

The targets for indicators of sustainable development vary by country, but the overall aim of the PoA is to positively impact air quality, soil condition, quality and quantity of employment and income generation, livelihood of the poor, access to affordable and clean energy services, human and institutional capacity, access to investment, and technology transfer and technological self-reliance. PoA impacts on these indicators are further described below:

- Air quality – Use of project stoves reduces the end-users' exposure to household air pollution which is linked to many different diseases such as tuberculosis, asthma, cardiovascular and ocular diseases, peri-natal health outcomes and acute and chronic respiratory diseases. It is a major killer of children under 5 years worldwide and primarily affects women and children who spend extended periods in smoky kitchens. International health experts are currently working to determine the level of smoke reductions that would be required to improve health among those at high risk for respiratory illnesses due to smoke exposure. We can theorise that by reducing the exposure to smoke among young children, there is potential to mitigate future risk of respiratory illness.
- Soil quality – Reduced wood harvests for household cooking through use of project stoves, and associated reduction in deforestation and forest degradation which are the norm, are unlikely to deteriorate soil quality. Soil quality at a community level is expected to be enhanced due to reduced soil erosion from the reduction in tree felling.
- Quality and quantity of employment, and income generation – The PoA promotes locally made technologies, creating jobs and opportunities for income generation for women and men primarily in rural areas where subsistence agriculture is the main source of employment, in the fields of stove production and installation, stove promotion and marketing, logistical and administrative support, and monitoring.
- Livelihood of the poor – The PoA improves household resilience through reduced household expenditure on woodfuel purchase and reduced burden of collecting and transporting woodfuel form increasing distances. The project also has the potential to improve food security through improved household fuel security. Project stoves are safer than baseline stoves, protecting women and children from accidental burns and scalds, as the stove's body shields the fire to contain the heat and the stoves are stable to minimise the risk of tipping and spilling hot contents of pots.
- Access to affordable and clean energy services – The PoA focuses on promoting technologies that are affordable, appropriate for local context and accessible at local level.
- Human and institutional capacity – The PoA promotes training in stove production and installation, marketing and stove promotion, kitchen and woodfuel management, and conducts awareness on improved cookstoves.
- Access to investment – The CME provides opportunities for direct foreign investment and access to payment for environmental services in the form of carbon revenues.
- Technology transfer and technological self-reliance – the PoA facilitates transfer and adoption of appropriate (e.g. south-south, rural-rural) locally designed and tested technologies that do not involve exotic parts or tools and promote self-reliance.

A.3. CMEs and participants of PoA

The coordinating and managing entity (CME) of the PoA is Hestian Innovation Ltd. which will be the entity to communicate with the CDM Executive Board.

A.4. Party(ies)

Name of Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Malawi (host)	Hestian Innovation Ltd.	No
Republic of Rwanda (host)	Hestian Innovation Ltd.	No

A.5. Physical/ Geographical boundary of the PoA

The devices will be used at a household level within the geographical national boundaries of the Republics of Malawi (13.9500° S, 33.7000° E) and Rwanda (1.9403° S, 29.8739° E).

A.6. Technologies/measures

The cookstove model which is the focus of initial dissemination is a Ceramic Stove called the *Chitetezo Mbaula* in Malawi and *Canarumwe* in Rwanda. This stove can be used as a portable stove or can be fixed, and has a laboratory test efficiency of 30.6%[4] (more than three times the default 10% efficiency of the baseline three stone and unimproved cookstoves) which results in reduced fuel consumption by improved combustion and improved heat transfer, raising the cooking pot to the hottest point above the flame. The Chitetezo Mbaula, based on the most recently independently verified monitoring report, has an average lifespan of 47 months,[5] can be used for various pot sizes, its efficiency does not significantly differ in aging stoves, and there was a single usage parameter of 66.96% for all stoves within the average life-span.[6] Later CPAs may focus on other cooking technologies that are least 20% thermal efficient and which are appropriate, affordable and accessible for communities in the project boundary provided that they meet the eligibility criteria of the PoA.

Ceramic Stove (*Chitetezo Mbaula* in Malawi, *Canarumwe* in Rwanda)

CPAs under the POA will initially focus on low-income rural and peri-urban households using non-renewable biomass energy on traditional/unimproved/low-efficiency stoves. Initially the PoA will target low-income rural and peri-urban households that cook and heat water with *firewood* on 3 stone fires or inefficient technologies;[7] subsequently CPAs may target households that that cook

[4] Tests were carried out in August 2012 by the Regional Stove Testing Centre, Centre for Research in Energy and Energy Conservation (CREEC), at College of Engineering, Design, Art and Technology, Makerere University, Kampala, Uganda (creec@tech.mak.ac.ug).

[5] Estimates are based on the most recent verification report for GS613, a Gold Standard project that has been developed by the CME that promotes the Chitetezo Mbaula in Malawi. The Verification Report is for the period 02/10/2012 to 01/10/2013 (both days inclusive). Lifespan estimated at 47 months (page 19 of 118).

[6] In GS613, for conservativeness, stoves that are older than the average life-span are not claimed and are not considered for emission reductions.

[7] The PoA primarily targets low-income firewood users in rural, peri-urban and urban areas, which represent the vast majority of the population in Malawi and Rwanda. In Malawi, for example, as per the 2011 Welfare Monitoring Survey conducted by the National Statistics Office based on a random sample that covered 14,000 households drawn from all the Districts of the country, the vast majority of households

and heat water with other types of non-renewable biomass such as charcoal. The Ceramic Stove is produced at a local level using locally available materials, thereby creating employment in a 'green' industry.

User manuals are to be distributed with each stove disseminated, educating users on good firewood and kitchen management practices to complement the use of an improved cook stove.

Example of a User Manual accompanying the Project stove

A.7 Public funding of PoA

No public funding from Annex I parties to the UNFCCC are envisaged to be made available for the proposed SSC-POA. If public funding from Annex I parties to the UNFCCC is provided, the CME shall confirm that the funding is not a diversion of Official Development Assistance (ODA).[8]

use firewood as their main source of energy (88%), with others using charcoal (7%), electricity (3%) and very few use paraffin, gas and other sources. Even in urban areas more households predominantly use firewood (44%) than charcoal (41%) as their source of energy. In Rwanda, as per the Rwanda market assessment carried out by Accenture for the Global Alliance for Clean Cookstoves, more than 95% of the population cook with biomass and 56% of the population are biomass collectors in rural areas and 47% of biomass users in urban areas predominantly use firewood. CPAs will initially targets firewood users, which, in Malawi and Rwanda, represent over 90% of rural households and approximately half of urban households, that don't use electricity. Areas such as urban Blantyre in Malawi, for example, where households predominantly use charcoal will not be targeted initially but households in Malawi headed by people without formal education that use firewood as their main source of energy almost entirely (97.3%) – will be targeted initially.

[8] Official development assistance (ODA) is defined in the OECD Glossary of Statistical Terms as follows: Flows of official financing administered with the promotion of the economic development and welfare of developing countries as the main objective, and which are concessional in character with a grant element of at least 25 percent (using a fixed 10 percent rate of discount). By convention, ODA flows comprise contributions of donor government agencies, at all levels, to developing countries ("bilateral ODA") and to multilateral institutions. ODA receipts comprise disbursements by bilateral donors and multilateral institutions (*OECD Glossary of Statistical Terms*)

SECTION B. Demonstration of additionality and development of eligibility criteria

B.1. Demonstration of additionality for PoA

The PoA reduces the amount of greenhouse gases (GHGs) emitted from fuelwood by introducing widespread use of improved cookstoves which replace existing less efficient devices. As per Item 2 (c) of EB Report 68 Annex 27 Version 09.0, such technologies to be promoted in project activities under the POA are defined as automatically additional for CPA sizes up to and including the small-scale CDM thresholds. Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds, are included in this exempt list, i.e. the size of each unit under 750 kW installed capacity or under 3,000 MWh of energy savings per year or 3,000 tonnes of emission reductions per year.

Based on the ex-ante estimations of emission reductions per household using a project stove, calculated as per equations detailed in B.6.3, the project technologies meet these criteria: each unit in Rwanda and Malawi can achieve 2 tonnes of emission reductions per year on average.

B.2. Eligibility criteria for inclusion of a CPA in the PoA

Based on EB 65 Report, Annex 3 – Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities (Version 01.0) points (a) to (l) of Item 14, Pages 3-4, this PoA meets the following eligibility criteria:

Eligibility Criteria	Means of Confirmation	Fixed at	
		PoA Level	CPA Level
a. CPAs shall be located within the geographical boundaries set in the PoA, i.e. the Republics of Malawi and Rwanda, unless otherwise discussed with and approved by the CDM;	The location of each individual CPA shall be specified in respective CPA-DDs.		✓
b. CPA cookstoves will be assigned unique serial identification numbers to be etched into the stove and captured on Emission Reduction (ER) contracts together with end-user details (name, address, phone number – if available)	This data shall be stored electronically and will be checked for double counting by comparing the serial numbers and user details. End-users are best traced through stove marketers / promoters, who normally know best where the end-user resides.		✓
c. CPA cookstoves shall primarily target rural and peri-urban households using woody biomass for cooking and heating water. CPA stoves, whether single pot or multi pot, portable or in-situ, shall have a minimum rated efficiency of 20%.	Target demographic shall be specified in respective CPA-DDs. Stove efficiency to be confirmed from independent reports on stove tests e.g. Water Boiling Test (WBT), Kitchen Performance Test (KPT) or Controlled Cooking Test (CCT).		✓
d. In addition to details in criterion (b), the date of sale shall be captured for	This data shall be stored electronically in the total sales record.		✓

improved household cookstoves, whereby date of commission is assumed to be (i) the day after the date of sale for retail sales or (ii) for stoves 'fixed' into cooking space the day after the date of installation or (iii) the last day of the month after the month of delivery for bulk sales.[9]			
e. Each CPA shall conform to applied methodology of the PoA – AMS-II.G. Version 06: Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass.	This applied methodology shall be referenced within respective CPA-DDs.		✓
f. As per B.1, CPA stoves shall be isolated units to be used by households, communities or Small and Medium Enterprises (SMEs) and shall be under 750 kW installed capacity or under 3,000 MWh of energy savings per year or 3,000 tonnes of emission reductions per year.	The size of each unit to be confirmed based on ex-ante emission reductions per year per household using a project stove (emission reductions per household per year shall not exceed 3,000 tCO2e).		✓
g. LSCs and EIA for improved household cookstoves should be conducted at PoA level.	Please refer to Section F for details of stakeholder consultations in Malawi and Rwanda, and Section E.1 on Environmental impact analysis.	✓	
h. CPAs funded through official development assistance or diversion of such will not be eligible for inclusion in the PoA;	A confirmation that the CPA is not funded through official development assistance should be provided to the CME by each CPA.		✓
i. Improved household cookstove CPAs should target domestic users using solid biomass as their primary fuel, with initial emphasis on low income rural and peri-urban communities.	Target group and distribution mechanisms to be specified within respective CPA-DDs.		✓
j. CPAs shall follow the monitoring plan outlined in generic CPA-DD section	Monitoring plan in generic CPA-DD Section B.7.2 will be referenced in real case CPA-		✓

[9] The CME has conducted an analysis of 1,338 sales records in November 2014 to determine the average shelf-life (i.e. difference between delivery date and sales date) of improved cookstoves for bulk sales (i.e. supermarkets, filling stations, nationwide retail outlets etc.) and it came to just less than 26 days. Therefore, we conservatively assume that the date of commission for bulk sales of ICS in this PoA is the last day of the month after the month of delivery. For example, stoves delivered for bulk sales on March 16th 2016 are assumed to be commissioned on April 30th 2016. The CME proposes to conduct a similar 'shelf life analysis' at least every 2 years to ensure conservativeness.

B.7.2 (Description of the monitoring plan for a generic CPA) which adheres to applied methodology – AMS-II.G, Standard for sampling and surveys for CDM project activities and programme of activities V 04.1 and Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities V 3.0;	DDs.		
k. The ER target for each CPA shall not exceed the small-scale CPA aggregate energy savings limit of 60 GWh per year or 180 GWh thermal per year in fuel input.	This will be confirmed by multiplying the ER per household per year by the number of households in the total sales record.		✓
l. CPAs shall not be a debundled component of a larger scale project activity.	As the project technologies are less than 1% of the small-scale thresholds defined by the methodology – described in PoA-DD Section B.1, or no more than 15 kW installed capacity or 0.6 GWh annual energy savings or 0.6 ktCO2e annual emission reductions, the CPAs are exempted from performing a debundling check.	✓	

In addition, each CPA included under the PoA shall satisfy Additionality criterion referenced in Section B.1, i.e. household cookstoves are included in the positive list of the Guideline on the Demonstration of Additionality of Small-Scale Project Activities.

B.3. Application of technologies/measures and methodologies

The PoA and its CPAs will apply a single approved small-scale methodology, *AMS-II.G Small-scale Methodology: Energy efficiency measures in thermal applications of non-renewable biomass (Version 06.0), effective February 21, 2014,* based on Section 2 of the methodology: Scope, applicability, and entry into force:

Proof that non-renewable biomass has been used in the project region (i.e. in Malawi and Rwanda as entire countries) since 31 December 1989 is available through widespread documentation of more biomass being consumed than is sustainably harvested, and is specifically outlined in an information note for the CDM which estimates fraction of non-renewable biomass for Least Developed Countries.[10] More specifically, Malawi's State of the Environment Report in 2010 estimated that 88.5% of the country's entire energy comes from biomass[11], that the 2008 census confirmed that the population had tripled since 1966[12] and a national annual deforestation rate of 2.8%[13] in the most densely populated country in Southern Africa[14]. The Global Forest Resources

10 CDM SSC WG 35th Meeting Report, Annex 20

11 State of the Environment Report, Malawi, 2010, page 48.

12 Ibid page 26.

13 Ibid, page 114.

Assessment 2010[15] (FAO) indicates that forest areas decline yearly, and that the total forest area declined by 27% from 1973 to 2010. Furthermore, the Malawi Integrated Household Survey gives an opportunity for analysing a trend in time spent collecting firewood, which has increased in time from 2004-2005[16] to 2010-2011[17]. The average length of time it takes for a person aged 15 years plus to collect firewood has more than doubled in just five years, from 1.4 hours per week in 2005 to 3.5 hours per week in 2010. According to a December 1998 Report by Malawi's National Economic Council (Reaching the Vision: Analysis of Possible Options): "…In 1985, it was estimated that 9.2 million cubic meters of fuel wood was consumed. The problem is that fuelwood consumption exceeds sustainable supply by 2.37 million cubic metres and expressed into deforestation, this deficit translates into net clearing of 50,000 hectares a year. If the situation remains unchecked, it could result in very serious land degradation and siltation of rivers and lakes."[18]

In Rwanda, the most densely populated country in Africa, in the executive summary of a market assessment of Rwanda, carried out by Accenture on behalf of the Global Alliance for Clean Cookstoves (2012) pointed out that *the driver for the government's involvement in cookstoves is the country's energy problem. Approximately 85% of Rwanda's energy comes from biomass, which has led to rapid deforestation over the last 20 years and is not sustainable.*[19] Rwanda's demand for energy was reported to be growing rapidly by 25 % per year due to population growth and the increase in economic activities.[20] Rwanda's total forest cover dropped from 698,660 hectares in 1990 to 545,000 hectares in 2005.[21] These figures clearly demonstrate that non-renewable biomass has been used in both Malawi and Rwanda since 1989, and that improving household energy productivity, where more can be done with less, is of great benefit and importance to both countries.

The PoA and CPAs focus on efficiency improvements in thermal applications of non-renewable through introduction of biomass fired cookstoves with a rated efficiency of over 20% compared to the 10% default efficiency of the baseline three stone and unimproved stoves. Independently tested laboratory efficiency of the PoA's ceramic stove is 30.6% (the most conservative of the test results) at 90% confidence level, having conducted 3 full tests (consisting of 3 parts) for each of the 3 stoves submitted.

The methodology is applicable as the aggregate energy savings of a single project activity will not exceed the equivalent of 60 GWh per year or 180 GWh thermal per year in fuel input.

Using conversion ratio of 3.6 MJ/kWh, 180 GWh is equivalent to 648,000 GJ project ceiling, and based on calorific value of biomass of 0.015TJ/tonne biomass, is equivalent to 43,200 tonnes of wood savings. The single methodology will be applied together with *Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities (Version 03.0), EB 75 Report Annex 8* as described in Section B.7.2 of Part II. Component Project Activity (CPA).

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14 Ibid, page 4.

15 FAO, Global Forest Resources Assessment 2010, Country Reports, Malawi Page 11.

16 Integrated Household Survey 2004-2005, Republic of Malawi Page 59 http://www.nsomalawi.mw/images/stories/data_on_line/economics/ihs/IHS2/IHS2_Report.pdf

17 Integrated Household Survey 2010-2011, Republic of Malawi Page 95 http://www.nsomalawi.mw/images/stories/data_on_line/economics/ihs/IHS3/IHS3_Report.pdf

18 Malawi's National Economic Council *Reaching the Vision: Analysis of Possible Options*, 1998 Page 13 http://www.millennium-institute.org/resources/elibrary/papers/MalawiVision.pdf

19 Global Alliance for Clean Cookstoves, Rwanda Market Assessment, Sector Mapping, Accenture Development Partnerships, 2012.

20 GIZ, Renewable Energies in East Africa, Rwanda Chapter, 2009, page 68.

21 FAO, Global Forest Resources Assessment 2010, Country Reports, Rwanda, Page 9.

Sampling Plan - Design

Due to the large number of improved cook stoves (ICS) envisaged to be distributed as part of the CPAs to be included in the PoA, it is not economically feasible to monitor each individual ICS unit distributed. Therefore, representative sampling will be undertaken as part of a PoA-wide Sampling Plan that is designed in line with the requirements of AMS II.G v6.0 and the "Standard for sampling and surveys for CDM project activities and programme of activities Version 04.1" (the Sampling standard). This sampling plan follows the recommended outline as contained in "Guidelines for sampling and surveys for CDM project activities and programme of activities Version 3.0". This approach is justified when sampling across CPAs as the differences among the sampled CPAs are taken into account in the sample size calculation by using stratified sampling.

Monitored Parameter:	Description of Parameter:
$n_{y,j}$	Proportion of ICS still in operation
$\mu_{y,i}$ /365	The relative share of usage of the project ICS if a baseline (replaced) stove is still being used in addition to ICS (hereafter called "retention use of ICS")
$\eta_{new,y,i}$	Thermal Efficiency of operational ICS

Target population
The target population for n_y are the users contained in the CPA databases. The target population for all other parameters are those ICS that are found in operation.

Sampling method
The sampling method for all three monitored parameters is stratified random sampling (as per "Guidelines for sampling and surveys for CDM project activities and programme of activities Version 3.0"). This method is justified as the population will be divided into Primary Sampling Units (PSUs) by same country and fuel consumption cluster, ICS type, ICS vintage and CPA implementer. These PSUs are expected to be relatively homogenous but by dividing them into strata any variation will be captured.

Once the PSUs are defined, ICS will be randomly selected based on the relative size of the strata. To ensure a random selection of ICS, random number generators shall be applied. Each ICS in the strata is uniquely identifiable by its serial number. Each ICS can thus be allocated a Sample Selection Number in each monitoring period for the sampling frames relevant to each parameter, starting at 1 and increasing up to the total number of ICS in the Database for that pre-defined sampling frame (see below). Applying the random number generators, the ICS can then be randomly chosen from the defined strata up to the required sample size as calculated by the CME.

Sample size
For the estimation of the proportion or mean value of the parameters investigated across CPAs, the minimum sample size for each sample frame is determined to achieve the 95/10 threshold for annual and 95/10 for biennial sampling.[22] In case a single CPA is sampled or sampling is not done across CPAs, a 90/10 confidence/precision is required for annual sampling and 95/10 confidence/precision shall be required for biennial sampling.[23]

The procedure to determine the sample of ICS will ensure that they adequately represent the broader project population, minimizing sampling error. Using a 95 per cent confidence level and a 10 per cent margin of error, a stratified random sample of users will be selected using Primary Sampling Units as strata.

[22] See Paragraph 39 in AMS–II G v6.0.

[23] See Paragraph 39 in AMS–II G v6.0.

There are three parameters that will be estimated through sampling as described above. The parameters will be sampled in two separate surveys (1) single survey to estimate parameters for (i) operating stoves and (ii) proportion of displaced traditional cook stoves that continue to be used and (2) a separate survey to measure the mean operational efficiency with a stratified random sample of ICS using the above described confidence/precision levels depending on annual or biennial monitoring frequency.

An overview of estimated sample sizes for a hypothetical population of 80,500 ICS divided in five strata applying a level of 95/10 is provided below. It is likely that the sample frame will include fewer than 80,500 users and five strata in the first monitoring period, so this is a conservative approach. Of the three parameters to be monitored, two are proportions/percentages ($N_{y,i,a}$) and ($\mu_{i,a}$*/365)* and the other one is a mean value ($\eta_{new,i,a}$*)*.

All strata will be sampled. The ICS within each stratum shall be randomly selected. To calculate the required sample size estimates, values for the proportions, mean values, and variances or standard deviations are required. For the first monitoring period, values from a pilot study shall be applied. For the following monitoring periods, the estimates shall be adjusted taken the results of the previous monitoring period(s) into account.

Parameter Proportion of stoves that are still in operation ($N_{y,i,a}$)

To estimate the number of users to be sampled for parameter $N_{y,i,a}$ the following equation[24] is used:

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

Where:

n	=	Sample size
N	=	Total number of ICS installed
V	=	expected variance
1.96	=	Represent the level of confidence (e.g. 1.96 for 95% confidence).
0.10	=	Required precision (e.g. 10% = 0.1)

$$V = \frac{SD^2}{\overline{p}^2} = \frac{overall\ variance}{\overline{p}^2}$$ and $\overline{p}$ is the overall proportion

$$SD^2 = \frac{(g_a * p_a(1-p_a)) + (g_b * p_b(1-p_b)) + (g_c * p_c(1-p_c)) + ... + (g_k * p_k(1-p_k))}{N}$$

$$\overline{p} = \frac{(g_a * p_a) + (g_b * p_b) + (g_c * p_c) + ... + (g_k * p_k)}{N}$$

Where:

g_i	Size of the i[th] group (CPA) where i=1 or a,…,k
p_i	Proportion of the i[th] group (CPA) where i=a,…,k
N	Total population

A hypothetical example to determine sample size for $N_{y,i,a}$ with five strata is shown below[25], which could be for different geographic areas where the same stove is disseminated. In this example the total number of ICS distributed is 80,500[26].

[24] As per equation 1, in Annex 3, page 63 of 99 in "Guidelines for sampling and surveys for CDM project activities and programme of activities, V3.0"

[25] Spreadsheet of example calculation has been provided to DOE

[26] All estimated proportion and ICS distributed in each stratum are estimates.

CPA #	Number ICS deployed	Estimated retained usage
CPA 1	17,000	0.87
CPA 2	14,000	0.92
CPA 3	16,000	0.88
CPA 4	17,000	0.85
CPA 5	16,500	0.86
Total	**80,500**	

Substituting the values above into Equations gives:

$$SD^2 = \frac{(17{,}000 * 0.87(1-0.87)) + (14{,}000 * 0.92(1-0.92)) + (16{,}000 * 0.88(1-0.88)) + (17{,}000 * 0.85(1-0.85)) + (16{,}500 * 0.86(1-0.86))}{80{,}500}$$

= 0.10927

$$\bar{p} = \frac{(17{,}000 * 0.87) + (14{,}000 * 0.92) + (16{,}000 * 0.88) + (17{,}000 * 0.85) + (16{,}500 * 0.86)}{80{,}500} = 0.87440993$$

Substituting the results gives $V = \frac{0.109277019}{0.87440993^2} = 0.142921863$

We can now substitute V and N into: $n \geq \frac{1.96^2 * 80{,}500 * 0.142921863}{(80{,}500-1) * 0.1^2 + 1.96^2 * 0.142921863} = 54.94$

Therefore the required sample size across all five CPAs is 55.

We can now use the formula below to calculate the required sample size for each CPA[27]:

$$n_i = \frac{g_i}{N} * n$$

Where:

n_i The sample size required for the i[th] group (CPA) where i=a,...,k
g_i Size of the i[th] group (CPA) where i=a,...,k
N Population total
n The total sample size required

Substituting the group, total and sample size for each CPA gives:

CPA	Number of ICS	Equation	Sample size required (not accounting for non-response)	Sample size required adjusted for non-response
CPA 1	17,000	$n_{CPA1} = \frac{17{,}000}{80{,}500} * 55 = 11.61$	12	16
CPA 2	14,000	$n_{CPA2} = \frac{14{,}000}{80{,}500} * 55 = 9.56$	10	14
CPA 3	16,000	$n_{CPA3} = \frac{16{,}000}{80{,}500} * 55 = 10.93$	11	15

[27] As per Equation 9 in Appendix 3 on page 64 of 99 in Guidelines for Sampling and Surveys for CDM project activities and programmes of activities v3.0.

V3.0	17,000	$n_{CPA4} = \frac{17,000}{80,500} * 55 = 11.61$	12	16
CPA 5	16,500	$n_{CPA5} = \frac{16,500}{80,500} * 55 = 11.27$	12	16
Total	**80,500**		**57**	**77**

Note that the total sample size has increased from 55 to 57 due to rounding up of sample sizes within each CPA. Having adjusted for response rate of 75% within each CPA, the total sample size required for 95:10 confidence and precision for the estimate of the retention rate is 77 cook stoves.

Parameter relative usage of project ICS if baseline stove is still being used in addition to ICS $\mu_{i,a}$*/365* (proportionate parameter)

According to the Standard for sampling and surveys for CDM project activities and programme of activities V4.1, a proportion can describe either of the two possible scenarios of the success rate or the failure rate. For example (i) cook stove still operational or (ii) cook stove no longer operational, and project proponents may use the larger of the two proportions in the sample size calculation, which is p or (1−p).

Based on results from extensive KPTs conducted in Malawi and Rwanda[28], it is estimated that the proportion of continued use of baseline technology is 0.077 (7.7%) during a given monitoring period. To be conservative, a 10% continued-use rate, equivalent to a 90% discontinued use is applied, Since the CPAs are assumed to be homogeneous with respect to the continued-use rate of displaced traditional cook stove, a simple random sampling plan is conducted to estimate the proportion parameter of interest.

CPA #	Number ICS deployed	Continued use of baseline	Discontinued use
CPA 1	17,000	0.08	0.92
CPA 2	14,000	0.09	0.91
CPA 3	16,000	0.10	0.90
CPA 4	17,000	0.11	0.89
CPA 5	16,500	0.12	0.88
Total	80,500		

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

Where:

n = Sample size
N = Total number of ICS installed
V = Expected variance
1.96 = Represent the level of confidence (e.g. 1.96 for 95% confidence).
0.1 = Required precision (e.g. 10% = 0.1)

$V = \frac{SD^2}{\bar{p}^2} = \frac{overall\ variance}{\bar{p}^2}$ and $\bar{p}$ is the overall proportion

$$SD^2 = \frac{(g_a * p_a(1-p_a)) + (g_b * p_b(1-p_b)) + (g_c * p_c(1-p_c)) + ... + (g_k * p_k(1-p_k))}{N}$$

[28] The CPAs, before verification, will conduct surveys to assess the actual continual usage of baseline technology.

$$\bar{p} = \frac{(g_a * p_a) + (g_b * p_b) + (g_c * p_c) + \ldots + (g_k * p_k)}{N}$$

Where:

g_i Size of the i[th] group (CPA) where i=1 or a,…,k

p_i Proportion of the i[th] group (CPA) where i=a,…,k

N Total population

$$SD^2 = \frac{(17{,}000 * 0.92(1-0.92)) + (14{,}000 * 0.91(1-0.91)) + (16{,}000 * 0.90(1-0.90)) + (17{,}000 * 0.89(1-0.89)) + (16{,}500 * 0.88(1-0.88))}{80{,}500}$$

= 0.08999

$$\bar{p} = \frac{(17{,}000 * 0.92) + (14{,}000 * 0.91) + (16{,}000 * 0.90) + (17{,}000 * 0.89) + (16{,}500 * 0.88)}{80{,}500} = 0.89975$$

Substituting the results for SD^2 and $\bar{p}$ gives $V = \frac{0.08999}{0.89975^2} = 0.11116$

We can now substitute V and N into: $n \geq \frac{1.96^2 * 80{,}500 * 0.11116}{(80{,}500-1) * 0.1^2 + 1.96^2 * 0.11116} = 42.72$

Therefore the required sample size across all three CPAs is 43.

We can now use the formula below to calculate the required sample size for each CPA:

$$n_i = \frac{g_i}{N} * n$$

Where:

n_i The sample size required for the ith group (CPA) where i=a,...,k

g_i Size of the i[th] group (CPA) where i=a,...,k

N Population total

n The total sample size required

Substituting the group, total and sample size for each CPA gives:

CPA #	Number ICS	Equation	Sample size required	Sample size adjusted for non-response
CPA 1	17,000	$n_{CPA1} = \frac{17{,}000}{80{,}500} * 43 = 9.08$	10	14
CPA 2	14,000	$n_{CPA2} = \frac{14{,}000}{80{,}500} * 43 = 7.47$	8	11
CPA 3	16,000	$n_{CPA3} = \frac{16{,}000}{80{,}500} * 43 = 8.54$	9	12
CPA 4	17,000	$n_{CPA4} = \frac{17{,}000}{80{,}500} * 43 = 9.08$	10	14
CPA 5	16,500	$n_{CPA5} = \frac{16{,}500}{80{,}500} * 43 = 8.81$	9	12
Total	**80,500**		**46**	**63**

Note that the total sample size has increased from 43 to 46 due to the rounding up of the sample sizes within each CPA. Having adjusted for a response rate of 75% within each CPA, the total

sample size required for 95:10 confidence : precision for the estimate of the retention rate is 63 cook stoves.

Operating efficiency ($\eta_{new,ia}$) of distributed improved cookstove (mean value parameter)

Based on CME's knowledge and experience with conducting water boiling tests in Malawi and Rwanda for the portable clay stove, for example, as part of project GS613[29] and programme GS1265[30], it is conservatively estimated that the expected mean is 0.25 with an expected standard deviation of 0.04 during a particular monitoring period. For this stratified sampling example the means and standard deviations for each CPA have been generated to reflect an overall mean and standard deviation of approximately 0.25 and 0.04 respectively while being heterogeneous across CPAs.

The equation to give us the required total sample size across all five CPAs[31] is:

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

where: $V = \frac{SD^2}{\overline{m}^2} = \frac{weighted\_overall\_expected\_variance}{weighted\_overall\_expected\_mean,\_squared}$

We use the figures from the table above to calculate the overall mean and variance[32]:

$$\overline{m} = \frac{(g_a * m_a) + (g_b * m_b) + (g_c * m_c) + ... + (g_k * m_k)}{N}$$

$$SD^2 = \frac{(g_a * SD_a^2) + (g_b * SD_b^2) + (g_c * SD_c^2) + ... + (g_k * SD_k^2)}{N}$$

Where:

g_i Size of the i[th] group (CPA) where i=1 or a,…,k

m_i Proportion of the i[th] group (CPA) where i=a,…,k

SD_i Standard deviation of the i[th] group (CPA) where i=a,...,k, (note that these are all squared so the group size is actually being multiplied by the group variance)

N: Total population

Substituting our values into Equations gives:

$$\overline{m} = \frac{(17{,}000 * 0.25) + (14{,}000 * 0.26) + (16{,}000 * 0.25) + (17{,}000 * 0.24) + (16{,}500 * 0.24)}{80{,}500} = 0.247578$$

$$SD^2 = \frac{(17{,}000 * 0.04^2) + (14{,}000 * 0.03^2) + (16{,}000 * 0.05^2) + (17{,}000 * 0.06^2) + (16{,}500 * 0.04^2)}{80{,}500} = 0.00208$$

Substituting the results gives: $V = \frac{0.00208}{0.247578^2} = 0.033926$

29 https://mer.markit.com/br-reg/public/project.jsp?project_id=103000000002314

30 https://mer.markit.com/br-reg/public/master-project.jsp?project_id=103000000000030

31 As per Equation 10 in Appendix 3 on page 66 of 99 in Guidelines for Sampling and Surveys for CDM project activities and programmes of activities v3.0.

32 Ibid, page 69 of 99 Equations 21 and 22 in Appendix 3

For the purposes of determining sample sizes in the first monitoring period estimates will be made for the mean and SD values from a pilot study. For the following monitoring periods, the estimates shall be adjusted taken the results of the previous monitoring period(s) into account. In this example a hypothetical scenario with four strata has been used as shown below to achieve the required 95/10 confidence/precision.[33]

Substituting the above values for N and V into $n \geq \frac{1.96^2 NV}{(N-1)*0.1^2 + 1.96^2 V}$ gives n = 13.03541

Therefore the required total sample size is 14 cook stoves.

CPA #	Number ICS	Equation	Sample size required (without allowing for non-response)	Sample size (considering non-response)
CPA 1	17,000	$n_{CPA1} = \frac{17{,}000}{80{,}500} * 14 = 2.956$	3	4
CPA 2	14,000	$n_{CPA2} = \frac{14{,}000}{80{,}500} * 14 = 2.43$	3	4
CPA 3	16,000	$n_{CPA3} = \frac{16{,}000}{80{,}500} * 14 = 2.78$	3	4
CPA 4	17,000	$n_{CPA4} = \frac{17{,}000}{80{,}500} * 14 = 2.956$	3	4
CPA 5	16,500	$n_{CPA5} = \frac{16{,}500}{80{,}500} * 14 = 2.86$	3	4
Total	**80,500**		**15**	**20**

The required sample sizes adjusted for a response rate of 75% is 20 stoves. However, as per paragraph 12 on the Standard if the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 shall be chosen when the parameter of interest is a proportion. If the parameter of interest is a numeric mean value (i.e. not a proportion or percentage), as is the case for parameter $n_{new,i,t}$, the Student's t-distribution shall be used if the resulting sample size is less than 30, ensuring that the two requirements of unbiased estimates and achieving reliability levels for the specific parameter determination are both met.

It is proposed that the survey for proportion of operational stoves and the proportion of discontinued use of baseline stoves be conducted together. According to the standard for sampling and surveys, if there is more than one parameter to be estimated in a survey, the required sample size has to be the largest number obtained in the calculations.

To estimate the mean efficiency of operational stoves, the CME could conduct a separate survey. Rather than estimating a proportion, in this case we estimate a mean value. The size of the required sample depends on the expected mean, the expected standard deviation and level of precision and confidence.

As per point 40 in the applied methodology, however, for cost effectiveness and to facilitate logistics the CME would prefer to monitor efficiency of devices in a common survey with other monitoring parameters (i.e. the usage survey); therefore, a random sub-sample within the common survey can be taken for which stove efficiency is tested, as long as the required precision for stove

[33] Spreadsheet of example calculation has been provided to DOE

efficiency is achieved. In other words, the CME proposes to randomly sample from the households (i) randomly sampled for the usage surveys and (ii) that are from the first year of the crediting period, and to randomly sample 30 households and to test the efficiency of stoves from at least 15 households from this sub-sample. If the required precision is not met and / or if there are not enough households from the first year of the project, more households can be sampled, through simple random sample as above, to meet required precision levels.

As this parameter of interest is a numeric mean value (i.e. not a proportion or percentage) the Student's t-distribution shall be used if the resulting sample size is less than 30, as per point 12 on Sampling and surveys for CDM project activities and programme of activities V4.1

As per point 39 in the applied methodology, in cases where survey results indicate that 95/10 precision is not achieved, the lower bound of the 95 per cent confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve 95/10 precision.

As per point 17 in *Sampling and surveys for CDM project activities and programme of activities V4.1* when sampling is undertaken, unless differently specified in the methodology applied, the sample mean (or proportion) value shall be used for the emissions reduction calculation, not the lower or upper bound of the confidence interval.

Sampling frame

The sampling frame refers to all the information in the database. The PoA is open to different CPA Implementers and different models of ICS. As explained below, to take the different characteristics of different CPA Implementer and ICS models into consideration, CPAs shall be grouped together to create a Primary Sampling Unit (PSU). Each PSU will be homogenous and variation between the PSU will be captured by the sampling method.

The Primary Sampling Units will be identified with the following four characteristics:

1. The same country
2. The same CPA Implementer
3. The same ICS model
4. The same ICS vintage[34]

CPAs with the same four parameters as described above can therefore be grouped together and form a Primary Sampling Unit. In the event the PoA has two different CPA Implementers using the same ICS model, these form at least two different Primary Sampling Units. The same is true if the same CPA Implementer has two different ICS models being implemented – these will form at least two Primary Sampling Units. If the same ICS type is being implemented by the same CPA implementer but the stoves are of different vintages then they will make up at least two Primary Sampling Units. If there are two identical CPAs in different countries these again will make up two primary sampling units. This is justified by the fact that CPA Implementer might vary in terms of performance and it is important for the CME to collect and monitor accurate data for each CPA Implementer distributing each stove model.

Sample Plan – Data to be collected

Data is collected by data collectors of the CPA implementers that are trained and have successfully pre-tested the questionnaire and thermal efficiency tests (e.g. water boiling test). At least half of the usage surveys are to be done in person involving visual inspections of the cooking place and the stove. Remaining surveys could be done by phone call, SMS or other proven ICT innovations as they evolve with time.

[34] Definition of ICS vintage: For the purposes of this PoA, an ICS vintage corresponds to all ICSs that have been in operation for the same amount of years. For example, stoves vintage 1 are all ICSs that have been in operation for less than 365 days. ICSs vintage 2 are those that have been in operation for longer than one year but less than two years.

Surveys can be conducted throughout the year. For conservativeness surveys from year 0 will be surveyed from the second third of year 1.

For the target population of rural and peri-urban households that use firewood as primary fuel, usage of improved cook stoves and their efficiency is not subject to seasonal variations.

Data collectors are to be supervised by agents of the CPA implementers to ensure that respondents of surveys understand questions and queries. Data collected via paper is to be scanned for data security. Electronic data will be stored centrally and backed-up.

For stratified sampling, non-response within GVH or Sector level (household in this case) is unlikely to be an issue, unless there is a high percentage of non-responses within a village. If there are only some missing values in a village it is still possible to obtain a usable proportion for that village based on all the other households that provide data. To cater for non-response, corrective actions include both oversampling (e.g. extra 25%) and, in the case where individuals are harder to find (e.g. peri-urban areas), non-respondents can be replaced with similar subjects, as recommended in paragraph 40 (g) of Guidelines for Sampling and Surveys for CDM project activities and PoA Version 3.0, page 11 of 98.

From an ethics perspective, sampled households are not obliged to respond to surveys but feedback on reasons for such cases of non-response is documented and analysed to improve survey design. Cases of out-of -population cases (e.g. death, migration etc.) are also documented.

Data outliers should be eliminated or replaced conservatively.

Data collected will ultimately be analysed and documented in periodic Monitoring Reports for the PoA.

Sample Plan – Implementation Plan

Data collectors have knowledge of the households and geographic areas to be surveyed. Typically they are people from the area being surveyed and have experience in promoting improved cook stoves or are involved in other community development activities in the area and typically have the trust of the surveyed households. Data collectors should be able to read and write and be able to understand the purpose and objectives of the survey and what information is being sought.

Equipment as prescribed in WBT protocol is to be available and should be calibrated as advised by manufacturers.

B.4. Date of completion of application of methodology and standardized baseline and contact information of responsible person(s)/ entity(ies)

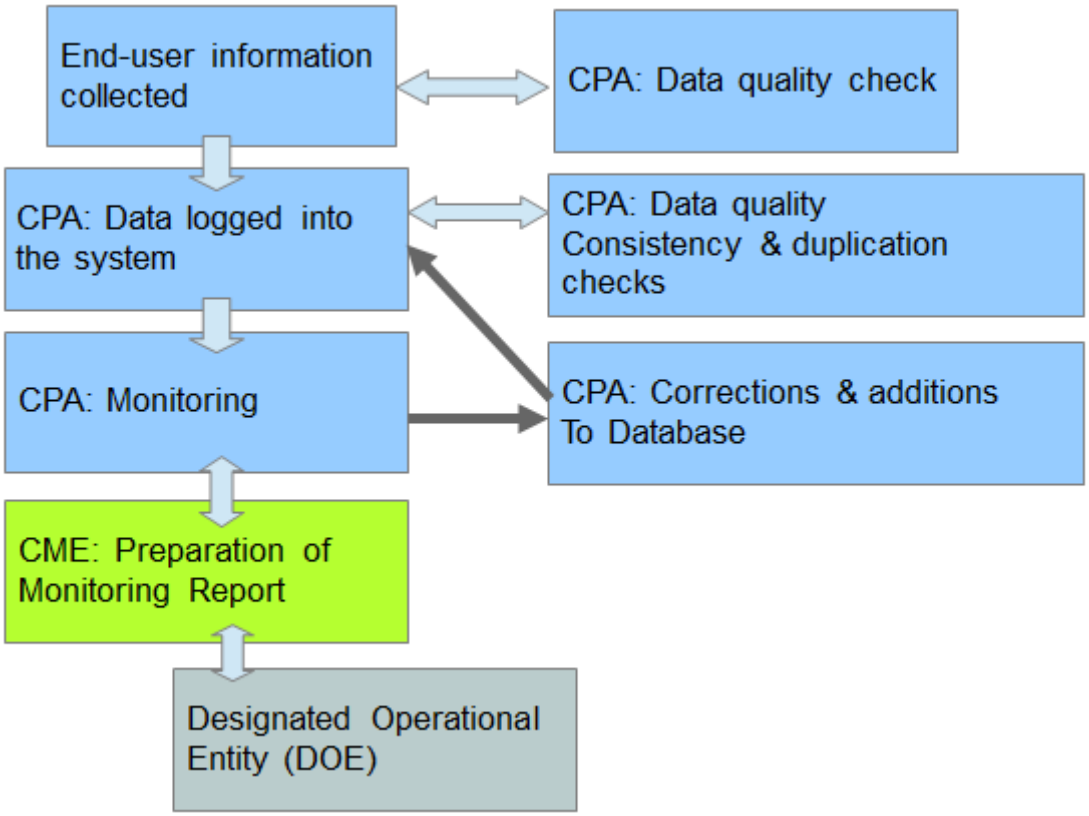
As of 22/04/2015 the most appropriate methodology for non-biomass switch, energy efficiency PoA.

Person and entity responsible for application of the selected methodology is also the CME; contact details below (same as in Appendix 1):

Mr. John O'Connor
+442071934710
info@hestian.com

SECTION C. Management system

The flow chart below illustrates the roles and responsibilities of the parties during the implementation of the PoA. (The CPA implementer is abbreviated to “CPA”, and can be Hestian or another party authorized by the CME.)



The CME will play a pivotal role in the development of CPAs and will oversee the inclusion of CPAs under the PoA. Through a technical review, the CME assesses the competence of potential CPA implementers to ensure that they fulfil technical and eligibility aspects of potential CPAs and to plan technical and administrative processes to meet PoA requirements.

A PoA operation and management plan is designed as per the above structure and the plan includes a set of measures for capacity building and continuous improvement of the PoA management. The PoA management will continuously seek ways for improvement based on the ongoing experience with the PoA operation, as well as the experience with other PoAs in the region and internationally. Among others, the following aspects of the PoA management will be regularly reviewed, but at least once a year:

1) Organizational structure, roles and competencies
2) Incorporation of the up-to-date CDM requirements in the PoA management
3) Relations with clients and stakeholders
4) Data keeping and recording
5) Training and qualification of the personnel

If necessary, the advice of a specialized consulting company will be also sought.

CME will oversee a composite electronic Total Sales Record while CPA implementers keep back-up records. End user information is collected through direct sales to end-users by retailers or agents of the CPA implementers and is contained in an emission reduction contract. This information is collated into a spreadsheet/database (Excel or other programmes which may emerge that assure quality) from which CPA monitoring can be conducted. The spreadsheet

/database records are backed up and sent to the CME for checking prior to using them as the basis for monitoring activities. Hard copies of Emission Reduction contracts are filed (in paper or electronically) as additional backup and for verification purposes. All CPA implementers will be strongly encouraged to scan ER contracts as an additional form of backup to secure data. As Electronic Communication Technology evolves and access improves, the CME intends to work with CPAs on improving communication with stove-users to facilitate better feedback and improved after-sales services. Such developments are documented in the updated operation and management plan.

Information on direct sales to end-users and associated emission reduction contracts is collected and cross-checked by CPA implementers before entering into database. Customers in database with phone numbers can be surveyed by SMS or telephone but at least half of all surveys are to be conducted in person for quality assurance purposes as a visit to the household is likely to generate more complete information.

Unique identification system for stoves will allow enumerators and other monitors/verifiers to determine if stove is part of a particular PoA or not. Where and when the stove has been produced is traceable through numbers etched into stoves before firing and CPA implementers can then cross-check their databases to verify which CPA each particular stove belongs.

Other projects or programmes that may promote the same technologies as this PoA will be encouraged to adopt a similar mutually beneficial system to be assured that the risk of double counting is nullified or discounted accordingly, should the risk emerge in practice.

CPA implementers are to share information on how households can use broken stoves as fixed stoves and households are encouraged to have more than one stove. Commercial approach to replacement stoves is encouraged, whereby each household knows how and where to conveniently access a replacement stove. CPA promoters will do so to guarantee future customers but also to ensure emission reductions and sustainable access to carbon finance. To emphasise the importance of access, all CPA implementers are to have a replacement stove policy in place to be part of the PoA. DOE will check for this policy at CPA level. This replacement policy details (i) records and documentation control process for each CPA including stove replacement procedures and (ii) procedures for checking and handling used stoves that fall below the prescribed methodology efficiency. CPA implementers are to be guided by the CME based on evidence generated through ongoing testing conducted as part of the monitoring plan of the POA whereby the CME can accurately extrapolate at which state specific improved cook stove devices fall below the minimum efficiency level of 20% due to wear and tear and/or partial breakages. When this state, which is to be clearly defined and documented by the CME, is reached the said improved cookstoves are to be disqualified from being considered for emission reductions in this PoA.

Monitoring tasks are managed by the CPA implementer in collaboration with the CME. Surveys are organised by agents of the CPA implementers, and enumerators are trained and re-trained prior to conducting surveys and tests. Survey and test results are filed in paper and/or in electronic form at the CPA implementer's office and are analysed using spreadsheets or database programmes to compile reports. The integrity of data is cross-checked with other variables to ensure consistency and avoid mistakes.

CME prepares and submits monitoring reports and facilitate the verification of the same and act as the focal point with the CDM Executive Board and the Gold Standard Foundation as it relates to the PoA and CPAs. If results of monitoring indicate that stoves no longer meet minimum efficiency criteria of PoA, they will not be included in calculation of emission reductions.

SECTION D. Duration of PoA

D.1. Start date of PoA

15/02/2014.

This is the date that the PoA-DD was uploaded to the UNFCCC website for global stakeholder consultation.

D.2. Duration of the PoA

28 years.

SECTION E. Environmental impacts

E.1. Level at which environmental analysis is undertaken

Environmental analysis is done at PoA level as similar technologies will be implemented across CPAs. The PoA does not require an EIA in Malawi as activity is not included in list of projects for which environmental impact assessment is mandatory, as per Section 24(1) of the Environmental Management Act of Malawi. In Rwanda, the Chief Operation Office from the Rwanda Development Board granted Hestian Innovation Ltd. an EIA exemption on the 12/05/2015 for a CDM programme of activities.[35]

E.2. Analysis of the environmental impacts

The project has an overall positive environmental impact, as described below:

- Reduced forest degradation and deforestation – Less solid biomass is required for household cooking; thus, fewer household fuelwood collections and reduced tree felling for household energy.
- Reduced greenhouse gas emissions and improved air quality – Reduced burning of solid biomass reducing the quantity of greenhouse gas emissions at household level, with primary focus on carbon dioxide. Less smoke and particulate matter are also released into the atmosphere.
- Improved soil quality and water quality and biodiversity – Reduced tree felling contributes to improved soil quality, reducing soil erosion and improving water quality through reduced surface run-off; and preserves the natural habitat for local flora and fauna.

The abovementioned impacts may extend even to areas outside of the project target areas; however, impact would be minimal and outside of the CME's scope for monitoring.

Potential negative impacts and the planned preventative measures, as identified at a stakeholder consultation level, are as follows:

1) Clay extraction that could result in environmental risks such as creation of incubators for pests such as mosquitoes, are to be monitored and managed in such a way as to avoid the creation of stagnant water pools or any other environmental hazards.
2) Clay stoves that need to be fired with firewood are only to be fired in fuel-efficient kilns and are to source sustainably harvested firewood to mitigate the potential negative impacts of clay firing.

Information, communication and training materials relating to such issues have been developed as outline in section F3 of this document.

[35] A scanned signed copy of the EIA exemption has been made available by the CME to the DoE for validation.

SECTION F. Local stakeholder comments

F.1. Solicitation of comments from local stakeholders

Stakeholder consultation is chosen to be conducted at a PoA level.

Stakeholder consultations have been held in Malawi and Rwanda regarding the PoA's cooking technologies at various levels including government, civil society and private sector, international and local community, beginning in 2008 in Malawi and 2012 in Rwanda. Key meetings are chronologically listed below for both countries:

1. November 14, 2008 – Formal stakeholder consultation meeting attended by 39 members of government, civil society and private sector in Lilongwe District, Malawi

2. November 19, 2008 – Formal field day attended by 68 participants in Chamama, Kasungu District, Malawi

3. July 23, 2012 – Formal stakeholder consultation meeting attended by 35 members of government, civil society and private sector in Kigali, Rwanda

4. October 17, 2012 – Formal stakeholder consultation meeting attended by 46 members of government, civil society, private sector and farming community in Mponela, Dowa District, Malawi

5. October 23, 2012 – Informal stove open day attended by 3,250 community level stakeholders including Traditional Authority, Group Village Headmen, Village Heads, agriculture groups, teachers and students, health and forestry extension workers, religious heads, youth clubs, police, community based organisations and other community members in Kamphata, T/A Chimombo, Nsanje District, Malawi

6. October 25, 2012 – Informal stove open day attended by 1,935 community level stakeholders including Traditional Authority, Group Village Headmen, Village Heads, agriculture groups, teachers and students, health and forestry extension workers, religious heads, youth clubs, police, community based organisations and other community members in Dinyero, Nguluwe, T/A Mbenje, Nsanje District, Malawi

7. November 13, 2012 – Informal stove open day attended by 2,454 community level stakeholders including Traditional Authority, Group Village Headmen, Village Heads, agriculture groups, teachers and students, health and forestry extension workers, religious heads, youth clubs, police, community based organisations and other community members in Mphamba, T/A Tengani, Nsanje District, Malawi

8. November 15, 2012 – Informal stove open day attended by 4,358 community level stakeholders including Traditional Authority, Group Village Headmen, Village Heads, agriculture groups, teachers and students, health and forestry extension workers, religious heads, youth clubs, police, community based organisations and other community members in Ching'oma, T/A Makoko, Nsanje District, Malawi

9. August 22, 2013 – Informal stakeholder meeting for 30-40 forestry and energy officers, stove producers and Chinkwita and Chifufuza GVHs in Chinkwita and Chifufuza Villages, Dedza District, Malawi

10. March 6, 2014 – Formal stakeholder consultation meeting attended by 34 members of government, including the Designated National Authority, civil society, private sector, district and cooperative representatives in Nyamasheke District, Rwanda

11. April 29, 2014 – Formal stakeholder meeting attended by 35 stove producers, trainers of producers, trainer supervisors and stove project planners at Kivu Potter's Cooperative, Rugerero Sector, Rubavu District, Rwanda

12. November 14, 2014 – Formal stakeholder consultation meeting attended by 36 members of government, civil society and private sector in Lilongwe District, Malawi

The above listed meetings are in addition to numerous small stakeholder meetings and community awareness activities such as road shows. Formal stakeholder consultation meetings addressed:

1. Non-technical summary of the project (presented in English and local vernaculars Chichewa and Kinyarwanda)

2. Overview of the programme and its implementers, objectives of the programme and project activities, the technologies to be disseminated, target areas and opportunities at local and national level for stakeholder involvement

3. Project activities and impact on sustainable development

4. Stakeholders' questions and feedback on the perceived impacts of the project activities at local, national and regional levels.

Stakeholder consultation will continue with project expansion at various stakeholder levels.

F.2. Summary of comments received

Feedback from the various stakeholders is overwhelmingly positive in both Malawi and Rwanda and the CME is encouraged to expand the project to as many local communities as possible. Stakeholders are also hopeful that the project can eventually encourage households to move away from use of unsustainably (and illegally) produced charcoal in urban areas of Malawi.

Advice and concerns raised by stakeholders include:

- Need for community sensitisation and awareness creation of improved technologies and practices.
- Potential for further efficiency improvements to the efficient kiln currently used to fire stoves
- Need to protect the Chitetezo Mbaula brand in Malawi (national certification process has already begun with the Malawi Bureau of Standards).
- Need to monitor clay extraction sites and ensure plans to mitigate any environmental risks are implemented effectively.
- Need to ensure production groups grow their own trees to that their source of fuel for firing ceramic stoves is from a sustainable source.[36]

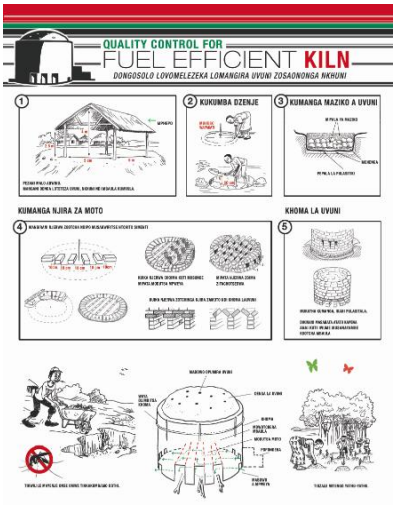
F.3. Report on consideration of comments received

CME and CPA implementers seriously consider the issue of clay management with a view to minimising negative environmental impacts, strive to promote:

- the collection of clay from above-ground piles of earth;
- where above-ground sourcing is not possible, the minimisation of pit depths; and
- the rapid replacement of clay removed from pits with biodegradable household and agricultural wastes.

[36] Approximately 250 kg of firewood are used to fire 120 stoves. Allowing for stove breakages, less than 3 kg of wood are used to fire a ceramic stove, compared to over 1,000 kg of firewood saving per year (i.e. firewood savings of 1 day of use is greater than amount of food it takes to fire a ceramic stove). The firewood used to fire a stove is negligible compared to the firewood savings from its use over its lifetime.

In addition, all production groups will be strongly encouraged to manage their own woodlots where they can source firewood to fuel their fuel-efficient kilns. The CME in collaboration with CPA implementers will promote this practice through information, communication and training materials, such as the poster shown below:



SECTION G. Approval and authorization

A host country letter of approval (LoA) serial number EAD/99/07/26A dated 2015-04-01 has been granted by the DNA of the Republic of Malawi (Environmental Affairs Department). The letter has been received from the PP, and is signed by an authorized party for the Director of Environmental Affairs.

A host country letter of approval (LoA) serial number 0906/DNA/2015 dated 2015-05-15 has been granted by the DNA of the Republic of Rwanda (Rwanda Environment Management Authority). The letter has been received from the PP, and is signed by an authorized party –The Director General.

PART II. Generic component project activity (CPA)

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

Each CPA will promote sustainable development and the reduction of greenhouse gas emissions from non-renewable biomass fuel through dissemination of improved household cookstoves under the Biomass Energy Conservation (BEC) PoA initiative by Hestian Innovation Ltd. (Hestian).

SECTION B. Application of a baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology(ies) and standardized baseline(s)

CPAs will apply the methodology referenced in the POA-DD: *AMS-II.G Small-scale Methodology: Energy efficiency measures in thermal applications of non-renewable biomass (Version 06.0).*

As prescribed by the Methodology, the following documents are also referenced for project development and implementation:

1. General guidelines for SSC CDM methodologies Version 20.0

2. Standard for sampling and surveys for CDM project activities and programme of activities Version 04.1
3. Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories Version 08
4. Guidelines on the demonstration of Additionality of small-scale project activities Version 09.0.
5. Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities V 3.0.

B.2. Applicability of methodology(ies) and standardized baseline(s)

The CPA activities focus on promoting efficient improved cookstoves that use less wood for cooking and heating to reduce[37] or replace use of traditional cooking technologies in order to achieve savings of non-renewable biomass and GHG emission reductions. This description meets the key elements of the methodology described below:

- Typical project(s) – Introduction of high-efficient thermal energy generation units utilizing non-renewable biomass or retrofitting of existing units (e.g. complete replacement of existing biomass fired cook stoves or ovens or dryers with more-efficient appliances) reduces use of non-renewable biomass for combustion.
- Type of GHG emissions mitigation action **–** (a) Energy efficiency. Displacement or energy efficiency enhancement of existing heat generation units results in saving of non-renewable biomass and reduction of GHG emissions.

The CPA target countries also meet the methodology criterion of using non-renewable biomass since December 31, 1989:

According to a December 1998 Report by Malawi's National Economic Council (Reaching the Vision: Analysis of Possible Options): "…In 1985, it was estimated that 9.2 million cubic meters of fuel wood was consumed. The problem is that fuelwood consumption exceeds sustainable supply by 2.37 million cubic metres and expressed into deforestation, this deficit translates into net clearing of 50,000 hectares a year. If the situation remains unchecked, it could result in very serious land degradation and siltation of rivers and lakes."

World Bank 1994 Technical Paper 242 (What Makes People Cook with Improved Biomass Stoves?) using 1991 prices found that the fuel savings from one month of using an improved stove (in Rwanda) would pay for the stove because of the high price of fuel. This high price can be considered indicative of the increased scarcity and by extension non-renewability of the biomass used for fuel in Rwanda.

Each CPA will meet the applicability criterion that the aggregate energy savings of a single project activity shall not exceed the equivalent of 60 GWh per year or 180 GWh thermal per year in fuel input.

B.3. Sources and GHGs

	Source	Gas	Included?	Justification/Explanation
Baseline	Combustion of non-renewable woody biomass for cooking	CO2	Yes	Major source of emissions.
		CH4	No	Minor source of emissions. Not required by methodology.

[37] Complete elimination of continued use of the baseline technology is unlikely but will be encouraged through the project. Use of inefficient baseline technologies and practices will be discouraged and alternatives proposed through this PoA.

	(traditional 3 stone open fire)	N2O	No	Minor source of emissions. Not required by methodology.
Project Activity	Combustion of non-renewable woody biomass for cooking (fuel efficient stove)	CO2	Yes	Major source of emissions.
		CH4	No	Minor source of emissions. Not required by methodology.
		N2O	No	Minor source of emissions. Not required by methodology.

B.4. Description of baseline scenario

For each CPA the baseline scenario is defined as "the use of fossil fuels for meeting thermal energy needs" in the absence of the project activity. In the case of the CPAs, in the absence of project activity, the three stone fire and/or inefficient unimproved stoves are used to meet household cooking needs.

In Malawi more than 9 out of 10 rural households use a three stone fire to meet their basic energy needs. This was documented in the National Energy Policy of 2003[38] and has since been collaborated by various baseline studies such as the baseline survey carried out by the CME in 2009. Households using firewood as their primary fuel are the targeted population of this PoA in Malawi.

In a baseline survey conducted in 2013 in Rwanda, 51% of households were using the 3 stone fire and 49% were using 'Darfur' stoves[39]. Fuel use was self-reported to be approximately 69 kg per week for households using a Darfur stove and 62 kg per week for those using the 3-stone fire, which suggests that the Darfur stove used in rural households in Rwanda is not more efficient than the 3 stone fire.[40]

B.5. Demonstration of eligibility for a generic CPA

Each CPA will be assessed using eligibility criteria detailed in POA-DD Section B.2, for inclusion into the POA.

CPA activities are assumed to be additional as per Item 2 (c) of EB Report 68 Annex 27, as the technologies under the CPAs are solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds.

[38] The National Energy Policy, Department of Energy, 2003 cites that 91% of rural households use a 3-stone fire for domestic cooking and heating.

[39] The Darfur stove is made by shielding 5 - 7 pieces of fired clay bricks in a mud surround. The Darfur stove was introduced in Rwanda by the Ministry of Defence to enable rural populations to reduce pressure on the environment. The dissemination was sustained by communities but due to lack of standards in its installation there have been a lot of variations on the critical dimensions of the stove. At the same time many households tended not to maintain the stove, making the fireboxes expand as that of any other mud stove. The performance led the government of Rwanda to explore more opportunities in the area of improved rural stoves which lead the identification of the Chitetezo Mbaula stove (Canarumwe in vernacular) as per presentation by Energy, Water and Sanitation Authority of Rwanda at stakeholder consultation in Kigali, July 23, 2012.

[40] Fuel use was based on self-reported average weight of bone-dry bundles per week using different technologies. Fuel consumption reported for $B_{y=1,new,i,survey}$ in CPA-DD Section B.6.2 using KPT protocol is likely to be more precise as firewood is weighed using digital scales over a 72 hour period.

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

The CPAs makes the following applications based on the methodology:

- Use of an adjustment factor of 0.95 to account for leakages, negating the need for leakage surveys;
- Use of default national values approved by the CDM Board; and
- Monitoring plan outlined in B.7.2.

Equations 1, 2 and 6 from AMS-II.Gv6.0 used in calculating emission reductions in accordance with the PoA include:

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

Where:

i = Indices for the situation where more than one type of project device is introduced to replace the pre-project devices

ER_y = Emission reductions during year y in tCO_2e

$ER_{y,i}$ = Emission reductions by project device of type I during year y in tCO_2e

$$ER_{y,i} = \sum_{a=1}^{a=y} B_{y,savings,i,a} * N_{y,i,a} * \frac{\mu_{y,i}}{365} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fuel\_use} - LE_y$$

and

$$B_{y,savings,i,a} = B_{y=1,new,i,survey} \times ((n_{new,i,a=1} \times \Delta n_{y,i,a} / n_{old}) - 1)$$

as detailed in D.6.3 below.

B.6.2. Data and parameters fixed ex-ante

Data / Parameter:	$f_{NRB,y}$
Data unit:	%
Description:	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
Source of data:	UNFCCC website[41]
Value(s) applied	0.81 for Malawi and 0.98 for Rwanda
Measurement methods and procedures:	
Monitoring frequency:	The parameter value is fixed ex ante, and is to be re-assessed and fixed at the beginning of each crediting period.
QA/QC procedures:	
Purpose of data	Calculation of baseline emissions
Additional comment:	Default country specific value

[41] https://cdm.unfccc.int/DNA/fNRB/index.html

Data / Parameter	$NCV_{,biomass}$
Unit	TJ/t
Description	Net calorific value of the non-renewable biomass that is substituted
Source of data	AMS-II.G Version 6.0
Value(s) applied	0.015
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{projected\_fossilfuel}$
Unit	tCO_2/TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data	AMS-II.G Version 6.0
Value(s) applied	81.6
Choice of data or Measurement methods and procedures	Default value.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	η_{old}
Unit	%
Description	Efficiency of the system being replaced
Source of data	AMS-II.G Version 6.0
Value(s) applied	0.10
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Calculation of baseline emissions
Additional comment	The pre-project device is a three-stone fire using firewood (not charcoal) or a conventional device with no improved combustion air supply or flue gas ventilation.

Data / Parameter	L_y
Unit	Fraction
Description	Leakage adjustment factor for period *y*
Source of data	AMS-II.G Version 6.0
Value(s) applied	0.95
Choice of data or Measurement methods and procedures	Methodology allows for adjustment factor to be applied for leakage as an alternative to survey under paragraph 30 of Section 4.3 (Leakage) in AMS-II.G Version 6.0.
Purpose of data	Calculation of leakage
Additional comment	

B.6.3. Ex-ante calculations of emission reductions

Emission reductions per project technology are calculated as follows, using Equation 2 of the methodology:

$$ER_{y,i} = \sum_{a=1}^{a=y} B_{y,savings,i,a} * N_{y,i,a} * \frac{\mu_{y,i}}{365} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fuel\_use} - LE_y$$

Where:

ERy	Emission reductions during year *y* in tCO2e
a	'*a'* is the indices for the age (in years) of the cook stoves that are operating in the year '*y*' of the crediting period. At any year *y* of the crediting period (e.g. *y* = 1, 2, 3… or 7) there will be a population of operational devices of the type *i* with age varying from a=1 (the cook stoves installed during the current year *y*) up to the age a=y (the cook stoves installed during the first year of the crediting period). Since the lifetime of cook stoves is often shorter than the length of the crediting period and cook stoves are likely to show significant efficiency losses over time, this aspect is captured through the monitoring plan
$B_{y,savings,i,a}$	Annual quantity of woody biomass that is saved in tonnes per cook stove device of type *i* and age *a* in year *y* *(see equation below)*
$N_{y,i,a}$	Number of project devices of type *i* and age *a* operating in year *y,* as per paragraph 33 of AMS-II.G v6.0
$\mu_{y,i}$	Number of days of utilization of the project device during the year '*y'*. As pre-project devices (e.g. 3-stone fire) are unlikely to be totally decommissioned, surveys are to be designed to capture cooking habits and stove usage of households in the region, including quantification of use of baseline devices, by formulating questions and/or collecting evidence to determine frequency of usage of both project devices and baseline devices.
$F_{NRB,y}$	Fraction of woody biomass saved by the project activity in year *y* that can be established as non-renewable biomass using default country specific fraction of non-renewable woody biomass (f_{NRB}) values available on CDM website. The parameter value is to fixed ex-ante at the beginning of each crediting period.
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, wet basis)
$EF_{projected\_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Value of 81.6 tCO2/TJ used
LE_y	Leakage emissions in the year y; $B_{y,savings,i,a}$ will be multiplied by a net to gross adjustment factor of 0.95 to account for leakages

And $B_{y,savings,i,a}$ is calculated using Equation 6 of the methodology AMS-II.G Version 6.0:

$$B_{y,savings,i,a} = B_{y=1,new,i,survey} \times ((n_{new,i,a=1} \times \Delta n_{y,i,a} / n_{old}) - 1)$$

$$B_{y,savings,i,a} = (1.575 \text{ t/yr (Malawi) or } 1.271 \text{ t/yr (Rwanda)}) \times ((0.306 \times \Delta n_{y,i,a} / 0.10) - 1)$$

$$\Delta n_{y,i,a} = (n_{new,i,a} / n_{new,i,a=1})$$

Where $n_{new,i,a}$ is the thermal efficiency of the device 'i' at age 'a' determined using the water boiling test and $n_{new,i,a=1}$ is the thermal efficiency of the device at its first year of operation. The chosen approach to determine the value of $\Delta n_{y,i,a}$ is by monitoring the thermal efficiency of the devices installed in the first year and crediting period and the efficiency loss of this population is to be used to correct the initial efficiency of the population of devices installed later on.

$B_{y=1,new,i,survey}$	Annual quantity of woody biomass used by project devices in tonnes per device of type *i*, determined in the first year of the introduction of the devices, detailed in B.7.1.
n_{old}	Efficiency of the device being replaced (fraction); determined using a default value of 0.10 may be optionally used if the replaced device is a three stone fire (not charcoal) or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.20 may be optionally used. Use weighted average values (taking the amount of woody biomass consumed by each device as the weighting factor) if more than one type of device is being replaced.
$n_{new,i,a=1\ x\ \Delta n_{y,i,a}\ /\ nold}$	Thermal efficiency of the device of type i being deployed as part of the project activity (fraction), using WBT protocol carried out in accordance with national standards (if available) or international standards or guidelines of the initial efficiency determined in the year of its installation (a=1).

$$ER_{y,i} = \sum_{a=1}^{a=y} B_{y,savings,i,a} * N_{y,i,a} * \frac{\mu_{y,i}}{365} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fuel\_use} - LE_y$$

= Σ $B_{y,savings,i,a}$ x (Number of stoves) x ($\mu_{y,i}$ / 365) x 0.81 (Malawi) or 0.98 (Rwanda) x 0.015 TJ/tonne x 81.6 tCO2/TJ x 0.95

Where

ER_y	=<*emission reductions*> tCO_2e
$B_{y,savings,i,a}$	= <savings> t/wood– depends on efficiency loss of devices over time.
$F_{NRB,y}$	= 0.81 in Malawi or 0.98 in Rwanda
$NCV_{biomass}$	= 0.015 TJ/tonne
$EF_{projected\_fossilfuel}$	= 81.6 tCO2/TJ
LE_y	= 0.95 (factoring ERs by 0.95 is same as 5% leakage reduction)

Thus the annual emission reductions are estimated to be [*emission reductions*] tCO_2e/yr.

B.7. Application of the monitoring methodology and description of the monitoring plan

B.7.1. Data and parameters to be monitored by each generic CPA

Data / Parameter:	$B_{v=1.new.i.survev}$
Data unit:	t/HH/yr
Description:	Annual quantity of woody biomass used by project devices in tonnes per device of type *i*
Source of data:	Sample surveys.
Value(s) applied:	For the purposes of calculating ex-ante emission reductions, assumption is 1.638 Tonnes of woody biomass per year per household in Malawi and 1.271 tonnes of woody biomass per year per household in Rwanda.

Measurement methods and procedures	To be determined in Rwanda and Malawi in the first year of the introduction of the devices through a sample survey to be conducted together with surveys for proportion of operational stoves and the proportion of discontinued use of baseline stoves (the sample size of which have been assessed to avoid bias and to ensure reliability). For By=1,new,i,survey, surveyed households would not include those that are identified as either (i) continue to use baseline technology through response to the survey or through observation by enumerator or (ii) no longer use the improved cookstoves. From the remaining households, a measurement campaign is to be applied whereby households estimate amounts of woody biomass that is used in the project scenario using an appropriate local metric (e.g. bundles of wood) for an easily understood period (e.g. per week). The average local metric unit (e.g. bundles) of bone dry woody biomass is calculated based on samples collected in each cluster (i.e. GVH in Malawi or Sector in Rwanda, as detailed in B.3 of the PoA). For example, the average of 10 bundles of wood would be calculated per cluster (i.e. GVH or Sector) and adjusted for moisture content. As per paragraph 22 on page 11 of the methodology AS-II.G V6.0, as the baseline device is a three stone fire, the use of data loggers to record the continued operation of baseline devices is not practical; hence, surveys as described above are conducted.
Monitoring frequency:	Monitored in the first year of introduction of the devices (e.g. during the first year of the crediting period, y=1).
QA/QC procedures:	This approach has been successfully applied by the CME in a recent survey[42] and offers a practical and logistically feasible solution to measure project fuel use for specific devices that can be supervised to assure quality.
Purpose of data	Calculation of emissions reductions
Additional comment:	Figures from Malawi and Rwanda can be corroborated with data from Gold Standard SSC GS613 and Micro PoA GS1265, respectively.

Data / Parameter:	$N_{y,i,a}$
Data unit:	
Description:	Number of project devices of type *i* and age *a* that are operating in year *y*
Source of data:	Survey
Value(s) applied	For the purposes of calculating ex-ante emission reductions, assumption is 21,106 stoves in Malawi and 27,201 in Rwanda based on the first CPA with a conservative drop-out rate of 10%. This is the estimated maximum number of stoves the first CPA can host.
Measurement methods and procedures:	The installation date and recipient/location of each device shall be tracked individually, and emissions reductions shall be considered from the date of commissioning of each device. Monitoring shall consist of checking all devices or a representative sample thereof, at least once every two years (biennially) to determine if they are still operating; those devices that have been replaced prior to and independently from the monitoring survey by an equivalent in-service device can be counted as operating.

[42] Baseline survey conducted in Rwanda in June 2013 as part of GS PoA 1265 that has been validated by the Gold Standard.

Monitoring frequency:	Annually.
QA/QC procedures:	Sampling will be conducted by applying the 95/10 confidence precision for the sample size calculation.
Purpose of data	Calculation of baseline and project emissions.
Additional comment:	Replaced devices are considered operational.

Data / Parameter:	$\mu_{y,i}$ **/ 365** (number of days per year of utilisation of project stove)
Data unit:	Proportion
Description:	Number of days of utilization of the project device during the year '*y'* over 365 days
Source of data:	Survey using stratified sampling
Value(s) applied	For the purposes of calculating ex-ante emission reductions, assumption is the proportion of discontinued use of baseline technology is 90%, assuming a conservative 10% continued use of baseline technology based on baseline surveys by the CME where continued use of baseline technology was 7.7%.
Measurement methods and procedures:	$N_{y,i,a}$ is to be discounted for continued use of baseline technology confirmed through sampling, as explained in section B.7.2, Part II of the PoA-DD. The rounded-up value will be used. Replaced stoves will be considered operational. As pre-project devices are unlikely to be totally decommissioned, surveys are to be designed to capture cooking habits and stove usage of households in the region, including quantification of use of baseline devices, by formulating questions and/or collecting evidences to determine the frequency of usage of both the project devices and baseline devices. Discontinued use of baseline technology is predicted to be the larger proportion than continued use as explained in Section B.7.2 below.
Monitoring frequency:	At least once every two years (biennial)
QA/QC procedures:	Sampling will be conducted by applying the 95/10 confidence precision for the sample size calculation.
Purpose of data	Calculation of baseline and project emissions.
Additional comment:	Replaced devices are considered operational.

Data / Parameter:	$\Delta n_{y,i,a}$
Data unit:	%
Description:	Factor to consider the efficiency loss of the project device type *i* due to its aging at the year *y*
Source of data:	Survey – simple random sample using Water Boiling Test protocol
Value(s) applied	For the purposes of calculating ex-ante emission reductions, assumption is actual thermal efficiency in the field is 25% (although laboratory thermal efficiency tests estimate an efficiency of over 30%).
Measurement methods and procedures:	As per the WBT protocol.
Monitoring frequency:	Water Boiling Tests to be conducted in the first batch of stoves thereafter monitoring will determine the thermal efficiency of the devices installed at the first year of the crediting period, and the efficiency loss of this population will be used to correct the initial efficiency of the population of devices installed later on.

QA/QC procedures:	Conducted by a capable person with thorough understanding of internationally recognised WBT protocols, updated by the Partnership for Clean Indoor Air and the Global Alliance for Clean Cookstoves. The protocol is continuously revised. The most recent version is WBT Protocol 4.2.3 released March 19, 2014.
Purpose of data	Calculation of baseline and project emissions.
Additional comment:	

Data / Parameter:	$n_{new,l,a}$
Data unit:	Fraction
Description:	Thermal efficiency of device of type *i* being deployed as part of the project activity, with the age *a*.
Source of data:	Survey – simple random sample using Water Boiling Test protocol
Value(s) applied	For the purposes of calculating ex-ante emission reductions, assumption is actual thermal efficiency in the field is 25% (although laboratory thermal efficiency tests estimate an efficiency of over 30%).
Measurement methods and procedures:	As per the WBT protocol.
Monitoring frequency:	Water Boiling Tests to be conducted in the first batch of stoves thereafter monitoring will determine the thermal efficiency of the devices installed at the first year of the crediting period, and the efficiency loss of this population will be used to correct the initial efficiency of the population of devices installed later on.
QA/QC procedures:	Conducted by a capable person with thorough understanding of internationally recognised WBT protocols, updated by the Partnership for Clean Indoor Air and the Global Alliance for Clean Cookstoves. The protocol is continuously revised. The most recent version is WBT Protocol 4.2.3 released March 19, 2014.
Purpose of data	Calculation of baseline and project emissions.
Additional comment:	

B.7.2. Description of the monitoring plan for a generic CPA

The monitoring plan is designed to monitor the parameters (listed in Section B.7.1), which are required for calculation of the actual GHG emission reduction achieved by the CPA using *ex post* sampling survey.

The share of operating stoves and their efficiency will be determined based on sampling procedures as outlined already in Section B.3. Part I of the PoA-DD. The CME will be responsible for conducting the sampling surveys and maintaining a database with all operating stoves.

No monitoring for leakage through competitive uses of biomass is required, as the parameter *ER* calculations are discounted for that by deducting 5% (by factoring the estimated ERs by 95%).

The CME is responsible for collecting the monitoring data in accordance with the requirements from the CDM EB on monitoring and verification to ensure that the emission reductions are monitored recorded and reported accurately.

The CME will also keep records of any accidents or irregularities reported by the stoves owners. The CME will be responsible for verification of the measurement, data collection and the calculation of the emissions reductions.

All technical staff responsible for installation and maintenance of the stoves will be trained in terms of the understanding the requirements of CDM on the monitoring system. The technical, operational and maintenance trainings provided for the personnel will be described in each monitoring report.

Additional Elements of the Monitoring Plan

The monitoring plan shall ensure that only one ICS model is used in each CPA. Separate CPA-DDs will be developed for each individual stove model used in this PoA. The type of stoves will be confirmed at the time of purchase and the CME will ensure that it is added to the corresponding CPA. During monitoring, the stoves model data in the database will be compared against sales documents and during this procedure any erroneously included stoves will be excluded from the database before emission reductions are calculated.

The monitoring plan will further ensure compliance with the requirement of point 37 (a) and (b) of AMS-II.G., ver. 06.0.

a) The replaced low efficiency devices are disposed of and not used within the boundary or within the region.
b) If the baseline stoves continue to be used, monitoring shall ensure that the fuelwood consumption of those stoves is excluded from the B_{old}

The disposal or continued use of old devices will be confirmed through stratified sampling as described in Part I, Section B.3. of this PoA-DD. In case old devices are used, total emission reductions will be discounted following the below approach:

1) The share of households where old devices are used will be determined based on stratified sampling.
2) The amount of emission reductions calculated for the share of households where old stoves are used will be reduced by 50 % under the assumption that the old stove and the ICS are used 50% of the time each.

Stoves that are found to be broken during the usage and monitoring surveys will not be considered at all for emission reductions and will be considered out of use.

Stove types that are not identical with the CPA type during the monitoring period will not be considered for emission reductions.

Stoves sold before the before the CPA starting date will not be included or, if so, will only claim credits from the day after the starting date of the CPA and will be limited to a lifespan from the day of initial adoption.

CME will collaborate with other project developers active in the same geographic areas through national fora to ensure that any double counting risks are conservatively accounted for.

Data Records

Electronic database(s) will be operated and maintained by the CME or implementing entities appointed by the CME to ensure completeness and accuracy of monitoring information:

Stove records database:

The following information is collected for every ICS distributed:

- Type of appliance (ICS type) deployed
- Serial number (Stove-ID) of device

- Delivery date of appliance[43]
- User details (name, address and telephone if available) will be collected for the majority of customers.[44]

Data Management

See PoA DD part 1 B.3

Sampling Plan

See PoA DD, Part 1. Sampling will be conducted on PoA level.

Data to be collected

See PoA DD part 1 B.3

[43] For bulk sales the address of the retailer and delivery notes are to be made available for verification and auditing.

[44] Although it is difficult to track 100% of households that will eventually use the stove(s) promoted by the PoA, the CME will encourage project implementers to track as many as possible and definitely more than half. Given that (i) monitoring will be carried out at PoA level and it is envisaged that there will be multiple CPAs throughout Rwanda and Malawi, (ii) monitoring will be carried out annually, and (iii) effort will be made to collect information from all customers without bias; the CME believes that for monitoring purposes a sample from at least half the population can indeed be truly representative of the entire population to adopt ICS for the PoA.

Contact information of coordinating/managing entity and responsible person(s)/ entity(ies)

CME and/or responsible person/ entity	☒ CME ☒ Responsible person/ entity for application of the selected methodology(ies) and, where applicable, the selected standardized baseline(s) to the PoA
Organization	Hestian Innovation Ltd.
Street/P.O. Box	
Building	Cragmuir Chambers
City	Road Town, Tortola
State/Region	British Virgin Islands
Postcode	N/A
Country	British Virgin Islands
Telephone	+442071934710
Fax	N/A
E-mail	info@hestian.com
Website	www.hestian.com
Contact person	John O'Connor
Title	Mr.
Salutation	
Last name	O'Connor

Appendix 1. Affirmation regarding public funding

The CPA does not involve any diversion of ODA.

Appendix 2. Applicability of methodology(ies) and standardized baseline(s)

This section is left blank intentionally.

Appendix 3. Further background information on ex ante calculation of emission reductions

This section is left blank intentionally.

Appendix 4. Further background information on the monitoring plan

This section is left blank intentionally.

Appendix 5. Summary of post registration changes

This section is left blank intentionally as the CDM-SSC-PoA-DD-FORM is completed for the purpose of project registration.

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Document information

Version	*Date*	*Description*
03.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the programme design document form for small-scale CDM programme of activities (these instructions supersede the "Guideline: Completing the programme design document form for small-scale CDM programme of activities" (Version 03.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the PoA in B.4 and 0; • Add general instructions on post-registration changes in paragraphs 2 and 3 of general instructions and Appendix 5; • Change the reference number from *F-CDM-SSC-PoA-DD* to *CDM-SSC-PoA-DD-FORM*; • Editorial improvement.
02.0	13 March 2012	EB 66, Annex 13 Revision required to ensure consistency with the "Guidelines for completing the programme design document form for small-scale CDM programmes of activities".
01.0	27 July 2007	EB33, Annex43 Initial adoption.

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