



**Component project activity design document form for  
small-scale CDM component project activities**

**(Version 03.0)**

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

**COMPONENT PROJECT DESIGN DOCUMENT (CPA-DD)**

<b>Title of the CPA</b>	Malawi Biomass Energy Conservation Programme CPA 1
<b>Version number of the CPA-DD</b>	5
<b>Completion date of the CPA-DD</b>	07/07/2015
<b>Title of the PoA to which the CPA is included</b>	Biomass Energy Conservation Programme
<b>Host Party(ies)</b>	Republic of Malawi
<b>Estimated amount of annual average GHG emission reductions</b>	39,771

**SECTION A. General description of CPA****A.1. Title of the proposed or registered PoA**

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Biomass Energy Conservation Programme

**A.2. Title of the CPA**

&gt;&gt;

Malawi Biomass Energy Conservation Programme CPA 1

**A.3. Description of the CPA**

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The CPA aims to initially disseminate approximately 21,000 improved cookstoves (i.e. the technology) that are more efficient and use less wood for household cooking and heating than the traditional stoves; and to promote improved kitchen and firewood management practices e.g. use of less firewood, use of dry firewood, using a pot lid while cooking and soaking legumes before cooking (i.e. practices) to households in all three Regions of Malawi. The improved technology and practices are intended to replace less efficient technologies and practices and result in biomass conservation and a reduction of greenhouse gas emissions into the atmosphere from the burning of solid biomass.

Ancillary benefits include reduced smoke during cooking, which reduces exposure to health damaging pollutants and reduced time and effort procuring woodfuel.<sup>1</sup> The stoves are attractive to end-users and can result in quicker cooking times. The stoves are locally made using local materials wherever possible, resulting in local income generation and the acquisition of new skills for local people.

The coordinating/managing entity confirms that the CPA is neither registered as a CDM project activity nor included in another registered PoA.

**A.4. Entity/individual responsible for the operation of CPA**

&gt;&gt;

Hestian Innovation Ltd. (Hestian) is the project developer.

**A.5. Technical description of the CPA**

&gt;&gt;

Malawi fits into the criteria of an LDC and where biomass meets 93% of household and industrial energy needs.<sup>2</sup> Current solid biomass supply does not adequately meet demand. Further, Malawi is vulnerable to other challenges which affect its energy sector such as low purchasing power, adverse impacts of Indoor Air Pollution on women and children, and land degradation cause from overharvesting of wood. The baseline scenario is the same as the scenario existing prior to the implementation of the CPA.

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 contributes 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 former

<sup>1</sup> Woodfuel is used to mean all fuels originating from woody biomass, including charcoal, in distinction from firewood or fuelwood, which are understood to mean wood in its original composition.

<sup>2</sup> 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).

Head of State announced a target of 2 million clean and efficient cookstoves in the country by 2020.

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%<sup>3</sup> (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, improved heat transfer, raising the cooking pot to the hottest point above the flame, and improved heat retention. The Chitetezo Mbaula, based on the most recently independently verified monitoring report, has an average lifespan of 47 months,<sup>4</sup> 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.<sup>5</sup>

This CPA will initially focus on low-income rural and peri-urban households using non-renewable biomass energy on traditional/unimproved/low-efficiency stoves. The Ceramic Stove is produced at a local level using locally available materials, thereby creating employment in a 'green' industry.

This CPA's Selected Methodology is AMS-II.G. (Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass) Version 06 under Sectoral Scope 3 Energy Demand.

#### A.6. Party(ies)

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

#### A.7. Geographic reference or other means of identification

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The CPA will be implemented in the Republic of Malawi (13.9500° S, 33.7000° E), a landlocked country which shares its northwest border with the Republic of Zambia, northeast border with the United Republic of Tanzania, and its borders at east, south and west with the Republic of Mozambique.

Local producers and distributors were identified during stakeholder consultations which began in 2008 and are continuous. In each aspect of the project, the project implementer seeks to utilise existing community networks and to bring benefits to all involved.

<sup>3</sup> 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).

<sup>4</sup> 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).

<sup>5</sup> In GS613, for conservativeness, stoves that are older than the average life-span are not claimed and are not considered for emission reductions.



## A.8. Duration of the CPA

### A.8.1. Start date of the CPA

02/08/2015 is the expected start date of the CPA, which is the expected day of first installation, and after the PoA start date which is expected to be the 01/08/2015.

### A.8.2. Expected operational lifetime of the CPA

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21 years / 252 months.

## A.9. Choice of the crediting period and related information

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Renewable

### A.9.1. Start date of the crediting period

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The starting date of the crediting period will be 02/08/2015, the day of CPA registration / inclusion, which is after the PoA start date and after the date of PoA registration.

### A.9.2. Length of the crediting period

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7 years, renewable. The duration of the crediting period of any SSC-CPA shall be limited to the end date of the PoA regardless of when the CPA was added.

**A.10. Estimated amount of GHG emission reductions**

Emission reductions during the crediting period	
Years	Annual GHG emission reductions (in tonnes of CO <sub>2</sub> e) for each year
Year 1	21,415
Year 2	42,830
Year 3	42,830
Year 4	42,830
Year 5	42,830
Year 6	42,830
Year 7	42,830
Total number of crediting years	7 years
Annual average GHG emission reductions over the crediting period	39,771
Total estimated reductions (tonnes of CO <sub>2</sub> e)	278,396

**A.11. Public funding of the CPA**

The CPA does not involve any diversion of ODA.

**A.12. Debundling of small-scale component project activities**

As the CPA technology is 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 ktCO<sub>2</sub>e annual emission reductions, the CPAs are exempted from performing a debundling check.

**A.13. Confirmation for CPA**

The proposed CPA is neither registered as an individual CDM project nor is part of another Registered PoA of the CME.

**A.14. Contact information of responsible persons/ entities for completing the CDM-SSC-CPA-DD-FORM**

Mr. John O'Connor  
Hestian Innovation Ltd.  
+442071934710  
[info@hestian.com](mailto:info@hestian.com)

**SECTION B. Environmental analysis****B.1. Analysis of the environmental impacts**

Please refer to Section E.1 in the PoA DD for details on environmental impact analysis in Malawi. Please note that environmental analysis is provided at the PoA level, and no significant negative environmental impacts have been identified for the proposed project activity.

## **SECTION C. Local stakeholder comments**

### **C.1. Solicitation of comments from local stakeholders**

Stakeholder consultation is chosen to be conducted at a PoA level. Please refer to Section F in the PoA DD for details of stakeholder consultations in Malawi.

### **C.2. Summary of comments received**

Feedback from the various stakeholders is overwhelmingly positive in Malawi 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 so that their source of fuel for firing ceramic stoves is from a sustainable source.<sup>6</sup>

### **C.3. Report on consideration of comments received**

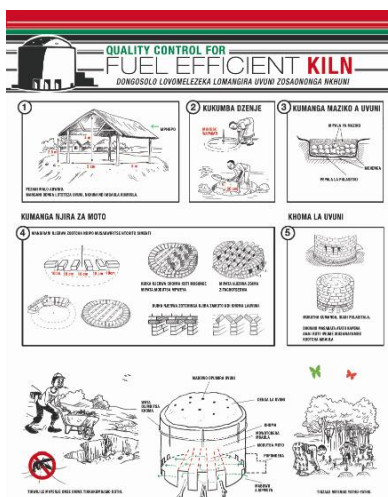
CME and CPA implementers seriously consider the issue of clay management with a view to minimising negative environmental impacts, strive to promote:

- 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.

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:

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<sup>6</sup> 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.



## SECTION D. Eligibility of CPA and estimation of emissions reductions

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

This CPA 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:

- General guidelines for SSC CDM methodologies Version 20.0
- Standard for sampling and surveys for CDM project activities and programme of activities Version 04.1
- Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories Version 08
- Guidelines on the demonstration of Additionality of small-scale project activities Version 09.0.
- Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities V 3.0.

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

The activities of this CPA focus on promoting efficient improved cookstoves that are at least 20% thermal efficient, and use less wood for cooking and heating to reduce<sup>7</sup> 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.

<sup>7</sup> 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.

- (b) 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."

This CPA qualifies as Type II: Energy efficiency improvement project activities that reduce energy consumption on the demand side, with output/fuel savings 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.

### D.3. Sources and GHGs

Source		GHGs	Included?	Justification/Explanation
<b>Baseline scenario</b>	Combustion of non-renewable woody biomass for cooking (traditional 3 stone open fire)	CO <sub>2</sub>	Yes	Major source of emissions.
		CH <sub>4</sub>	No	Minor source of emissions. Not required by methodology.
		N <sub>2</sub> O	No	Minor source of emissions. Not required by methodology.
<b>Project scenario</b>	Combustion of non-renewable woody biomass for cooking (fuel efficient stove)	CO <sub>2</sub>	Yes	Major source of emissions.
		CH <sub>4</sub>	No	Minor source of emissions. Not required by methodology.
		N <sub>2</sub> O	No	Minor source of emissions. Not required by methodology.

This CPA is located within the geographical boundary of Malawi which lies within the geographic boundary of the proposed PoA.

### D.4. Description of the baseline scenario

For this 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 this CPA, in the absence of project activity, the three stone fire is the main "stove" 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<sup>8</sup> 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.

### D.5. Demonstration of eligibility for a CPA

This CPA will be assessed using eligibility criteria detailed in POA-DD Section B.2, for inclusion into the POA and can be checked through this list:

<sup>8</sup> The National Energy Policy, Department of Energy, 2003 cites that 91% of rural households use a 3-stone fire for domestic cooking and heating.



Demonstration of Eligibility Condition	Means of Confirmation
a. The CPA is 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 the CPA is within the geographic boundary of the Republic of Malawi, which is the same as the boundary of the PoA.
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)	✓ Each improved cook stove is assigned a unique serial number etched into each stove. This is to 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%.	✓ This CPA target demographic is primarily rural and peri-urban households using woody biomass for cooking and heating water .  The thermal efficiency of the stove promoted in this CPA has been confirmed from independent reports (i.e. CREEC) on stove tests e.g. Water Boiling Test (WBT) as being 30.6% thermal efficient, which is greater than 20%.
d. In addition to details in criterion (b), the date of sale shall be captured for 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.	✓ This CPA complies with the eligibility criteria as its start date (DD/MM/YYYY) is after the PoA registration date 15/02/2015.
e (i) Each CPA shall conform to applied methodology of the PoA – AMS-II.G. Version 06	✓ The applied methodology is referenced in the CPA-DD.
e (ii) Only one model of ICS is used in a CPA	✓ The CPA introduces ICS model Chitetezo Mbaula, a local product made in Malawi.
e (iii) Only ICS models with efficiency of at least 20 % will be used.	✓ The efficiency of the introduced stoves is 30.6% which is more than 20%.
e (iv) The start data of the CPA is the date of the earliest purchase order/invoice/signed emission reductions contract for the stoves included in a particular CPA.	✓ The starting date of the CPA is DD/MM/YYYY, which is confirmed invoice / delivery note [XX]/signed emission reductions contract.
e (v) The CPA meets the applicability conditions of AMS-II.G., i.e.: The CPA uses only ICS & Non-renewable biomass has been used in the project region since 31 December 1989.	✓ This is confirmed at PoA level.
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 <i>ex-ante</i> emission reductions per year per household using a project stove (emission reductions per household per year shall not exceed 3,000 tCO <sub>2</sub> e).

g (i) Conditions for environmental assessment	✓ Environmental impact assessment is conducted on PoA level.
g (ii) Conditions for Stakeholders' Consultation	✓ Stakeholders' consultation is conducted on a PoA level.
h. The CPA does not lead to diversion of ODA.	✓ A confirmation that the CPA does not lead to diversion of official development assistance is provided to the CME.
j. CPAs shall follow the monitoring plan outlined in generic CPA-DD section 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;	✓ Monitoring plan in generic CPA-DD Section B.7.2 will be referenced in real case CPA-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. The CPA leads to annual fuel savings of <180 GWhth. [ <i>This will be confirmed through the database by multiplying the number of installed ICS by the annual energy savings per stove.</i> ] Based on ex-ante calculations, ER target for CPA is 45,084 tCO <sub>2</sub> e before leakage.
l. The CPA is not a debundled component of a larger scale project activity.	✓ This is confirmed at PoA level.
✓ The proposed CPA is a voluntary initiative by the CPA operator and is not implementing any mandatory policy or regulation.	✓ The proposed CPA is a voluntary by [ <i>name of the CPA operator</i> ] and is not implementing any mandatory policy or regulation. [ <i>Legislation and policy changes will be confirmed at the end of each monitoring period. Confirmation that the CPA is a voluntary activity is provided in each CPA-DD.</i> ]
✓ No ICS used in a particular CPA is transferred from another project activity.	✓ No ICS used in a particular CPA is transferred from another project activity. [ <i>To be cross-checked against the database and purchase orders to confirm that only new cook stoves are used.</i> ]

## D.6. Estimation of emission reductions

### D.6.1. Explanation of methodological choices

This 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 of PoA DD.

Equations 1, 2 and 6 from AMS-II.G v.6.0 used in calculating emission reductions in accordance with the PoA include:

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

and

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

and

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

as detailed in D.6.3 below.

#### D.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 <sup>9</sup>
Value(s) applied	0.81 for Malawi
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

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	$EF_{projected\_fossilfuel}$
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<sup>9</sup> <https://cdm.unfccc.int/DNA/fNRB/index.html>

Unit	tCO <sub>2</sub> /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	$\eta_{old}$
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	

### D.6.3. Ex-ante calculation of emission reductions

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

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

Where:

$ER_y$	Emission reductions during year $y$ in tCO <sub>2</sub> e
$a$	' $a$ ' 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 $y$
$\mu_{y,i}$	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 tCO <sub>2</sub> /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:

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

$$B_{y,savings,i,a} = B_{y=1,new,i,survey} (Malawi) \times ( (0.306 \times \Delta n_{y,i,a} / 0.10 ) - 1 )$$

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

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.

$n_{new,i,a=1} \times \Delta n_{y,i,a} / n_{old}$	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 ( $a=1$ ).
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$$ER_y = \sum B_{y,savings,i,a} \times N_{y,i,a} \times (\mu_{y,i} / 365) \times f_{NRB,y} \times NCV_{biomass} \times$$

$$EF_{projected\_fossilfuel} - LE_y$$

$$= \sum B_{y,savings,i,a} \times (\text{Number of stoves}) \times (\mu_{y,i} / 365) \times 0.81 \times 0.015 \text{ TJ/tonne} \times 81.6 \text{ tCO}_2/\text{TJ} \times 0.95$$

Where

$ER_y$	= <emission reductions> t CO <sub>2</sub> e
$B_{y,savings,i,a}$	= <savings> t/wood– depends on efficiency loss of devices over time and on the survey results from $B_{y=1,new,i,survey}$ .
$f_{NRB,y}$	= 0.81 in Malawi
$NCV_{biomass}$	= 0.015 TJ/tonne
$EF_{projected\_fossilfuel}$	= 81.6 tCO <sub>2</sub> /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<sub>2</sub>/yr.

#### D.6.4. Summary of the ex-ante estimates of emission reductions

Year	Baseline emissions (t CO <sub>2</sub> e)	Project emissions (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	Emission reductions (t CO <sub>2</sub> e)
Year 1	39,681	17,139	1,127	21,415
Year 2	79,362	34,278	2,254	42,830
Year 3	79,362	34,278	2,254	42,830
Year 4	79,362	34,278	2,254	42,830
Year 5	79,362	34,278	2,254	42,830
Year 6	79,362	34,278	2,254	42,830
Year 7	79,362	34,278	2,254	42,830
Total	515,853	222,804	14,652	278,396
Total number of crediting years	7 years			
Annual average over the crediting period	73,693	31,829	2,093	39,771

#### D.7. Application of the monitoring methodology and description of the monitoring plan

##### D.7.1. Data and parameters to be monitored

Data / Parameter	$B_{y=1,new,i,survey}$
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

Measurement methods and procedures	<p>To be determined in 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).</p> <p>For <math>By=1, new, i, survey</math>, 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.</p> <p>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, 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) and adjusted for moisture content.</p> <p>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.</p>
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 <sup>10</sup> 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 can be corroborated with data from Gold Standard SSC GS613 and Micro PoA GS1265, respectively.

<b>Data / Parameter:</b>	<b><math>N_{y,i,a}</math></b>
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	<i>[number of devices to be determined at CPA level]</i>
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.
Monitoring frequency:	Annually.

<sup>10</sup> Baseline survey conducted in Rwanda in June 2013 as part of GS PoA 1265 that has been validated by the Gold Standard.

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.

<b>Data / Parameter:</b>	<b><math>\mu_{y,i}</math> / 365</b> (number of days /year of utilisation of project stove)
Data unit:	%
Description:	Number of days of utilization of the project device during the year 'y'.
Source of data:	Survey using stratified sampling
Value(s) applied	[ <i>proportion of discontinued use of baseline technology</i> ]
Measurement methods and procedures:	<p><math>N_{y,i,a}</math> is to be discounted for discontinued use of baseline technology confirmed through stratified random 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.</p> <p>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.</p> <p>Discontinued use of baseline technology is predicted to be the larger proportion than continued use as explained in Section B.7.2 below.</p>
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.

<b>Data / Parameter:</b>	<b><math>\Delta n_{v,i,a}</math></b>
Data unit:	%
Description:	Factor to consider the efficiency loss of the project device type <i>i</i> due to its aging at the year <i>y</i>
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>Data / Parameter:</b>	<b><math>n_{new,i,a}</math></b>
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	[ <i>Efficiency of the improved cook stove to be defined at CPA level</i> ]
Measurement methods and procedures:	As per the WBT protocol.
Monitoring frequency:	Water Boiling Tests to be conducted annually. Conducted in the first batch of stoves thereafter monitoring will determine annually 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:	

### D.7.2. Description of the monitoring plan

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 all replaced stoves and 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. Erroneously included stoves will be excluded from emission reduction calculations.

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

1. The replaced low efficiency devices are disposed of and not used within the boundary or within the region.
2. 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 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:

1. Type of appliance (ICS type) deployed
2. Serial number (Stove-ID) of device
3. Delivery date of appliance<sup>11</sup>
4. User details (name, address and telephone if available) will be collected for the majority of customers.<sup>12</sup>

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<sup>11</sup> For bulk sales the address of the retailer and delivery notes are to be made available for verification and auditing.

**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

**SECTION E. Approval and authorization**

A Letter of Approval and Authorisation from DNA of the Republic of Malawi dated 7<sup>th</sup> April 2015, which explicitly states that an EIA is not required, has been issued to the CME.

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<sup>12</sup> 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 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 CPA implementer(s) and responsible person(s)/ entity(ies) for completing the CDM-SSC-CPA-DD-FORM

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

## Affirmation regarding public funding

The CPA does not involve any diversion of ODA.

## Applicability of methodology(ies) and standardized baseline(s)

This section is left blank intentionally.

## **Further background information on ex ante calculation of emission reductions**

This section is left blank intentionally.

## **Further background information on monitoring plan**

This section is left blank intentionally.

## **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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