



**Monitoring report form  
(Version 03.1)**

**Monitoring report**

<b>Title of the project activity</b>	Fuel Efficient Stoves in Zambia (3RL CPA No. 01)
<b>Reference number of the project activity</b>	PoA 6864
<b>Version number of the monitoring report</b>	1
<b>Completion date of the monitoring report</b>	14/10/2013
<b>Registration date of the project activity</b>	28/01/2013
<b>Monitoring period number and duration of this monitoring period</b>	Period 1 28/01/2013-14/10/2013 (inclusive of these dates)
<b>Project participant(s)</b>	3 Rocks Ltd.
<b>Host Party(ies)</b>	Zambia
<b>Sectoral scope(s) and applied methodology(ies)</b>	3 : Energy demand AMS II.G. Ver. 3: Energy efficiency measures in thermal applications of non-renewable biomass
<b>Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD</b>	40,684 from Fuel Efficient Stoves in Zambia (3RL CPA No. 01)
<b>Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period</b>	27,972 from Fuel Efficient Stoves in Zambia (3RL CPA No. 01)

## SECTION A. Description of project activity

### A.1. Purpose and general description of project activity

#### (a) Purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG removals by sinks;

The CPA involves the distribution of fuel-efficient stoves by 3 Rocks Ltd. (3RL) in individual households in Zambia. The CPA provides energy efficient cooking stoves based on the 'rocket stove' design. The efficient stoves are based on a design commissioned by 3RL and will be directly installed by 3RL for recipient households in exchange for certain labour and materials during installation. This technology ensures a 29.5% thermal efficiency against the 10% methodology default for the traditional 3-rock fire. The technology has been tested independently in accordance with the "Stove Manufacturers Emissions & Performance Test Protocol (EPTP)"<sup>1</sup> and certified by the Engines and Energy Conversion Laboratory at Colorado State University for its thermal efficiency.

Recipient households sign an acknowledgement that 3RL owns the rights to the CERs. It is the deployment of private seed capital and the revenue from the sale of CERs only that will fund the installation process. 3RL is the Managing Entity for the CPA.

Double-counting of emissions reductions is avoided by the unique referencing of stoves included in the CPA. This will be achieved through:

- **GPS references:** each stove has a unique GPS-referenced location. During the verification process the DOE will be able to check the existence of stoves related to this GPS location reference.
- **Name, location and/or ID number:** an additional check of double-counting may be made against the household name, location and/or Zambian government ID number of the stove recipient ascribed to each stove. This may be checked physically during the verification process.
- **Unique reference numbers:** each stove also has a unique reference number in the monitoring database. Only one stove will be installed per household. The DOE will be able to check this during the verification process.

The CPA involves the installation of a maximum of 15,938 stoves and, according to an ex-ante calculation, contributes to an emissions reduction equivalent to 40,684 tonnes of CO<sub>2</sub> per annum. In this way the CPA does not exceed a total of 180GWh of thermal energy generated.

The CPA does not involve funding from Annex I parties and does not result in a diversion of official development assistance.

#### *Contribution to Sustainable Development*

The CPA contributes to the sustainable development of the Zambian economy in a number of ways:

- i. Environmental
  - The CPA helps significantly reduce Zambia's greenhouse gas

<sup>1</sup> Stove Manufacturers Emissions & Performance Test Protocol (EPTP): A protocol for testing stove fuel efficiency and emissions and a standard for improved stoves; Defoort, L'Orange, Kreutzer (EECL), Lorenz (Envirofit), Kamping (Philips) 2009

- emissions over its lifetime
- The CPA helps reduce the use of non-renewable biomass from Zambian forests, assisting the maintenance of existing forest stock, protecting natural forest eco-systems and wildlife habitats<sup>2</sup>
  - The protection of standing forests ensures the maintenance of watersheds that regulate water table levels and prevent flash flooding<sup>3</sup>
- ii. Social
- Considerably less time is spent collecting wood fuel for the family home thereby reducing the work burden on families and presenting alternative opportunities for economic development
  - Cooking and heating with solid fuels on open fires or traditional stoves results in high levels of indoor air pollution. Indoor smoke contains a range of health-damaging pollutants, such as small particles and carbon monoxide<sup>4</sup>. Less carbon dioxide, carbon monoxide and particulates will be emitted by the fuel-efficient stove due to the decrease in total biomass burned, the increase in the efficiency of biomass burning and an increased fire temperature.
  - The stove provides a safer method for combusting biomass for cooking, helping to reduce burn injuries, especially for children, in the family home
- iii. Economic
- The CPA helps develop a section of the Zambian economy; in the installation of the stoves (including certain materials production; e.g. bricks and mortar) and monitoring activities.
  - The CPA brings employment benefits to Zambia and jobs will be created for its administration

The CPA delivers a long-term and secure contribution to sustainable development in Zambia that, without carbon finance, would not exist.

**(b) Brief description of the installed technology and equipment;**

The CPA will provide energy efficient cooking stoves based on the 'rocket stove' design. This technology ensures a 29.5% thermal efficiency against the 10% methodology default for the traditional 3-rock fire.

The stove consists of a durable metal alloy liner, with an insulating layer surrounding it. The liner and insulation are encased in a metal outer container, which is further attached to brick enclosure for protection and security. The liner is tapered at the top, where a galvanized cooking surface provides a rest for the cooking pot. The flame is directed onto the pot speeding up the flow of gases from the combustion chamber and the biomass fuel is supported using a metal grate to ensure adequate air flow to the fire. The whole stove is cemented to the floor ensuring the stove is largely protected from damage and theft.

<sup>2</sup> [http://www.illegal-logging.info/approach.php?a\\_id=54](http://www.illegal-logging.info/approach.php?a_id=54)

<sup>3</sup> [http://www.meted.ucar.edu/hazwarnsys/ffewsrq/FF\\_EWS.Chap.2.pdf](http://www.meted.ucar.edu/hazwarnsys/ffewsrq/FF_EWS.Chap.2.pdf)

<sup>4</sup> <http://www.who.int/indoorair/en/>



Stove alloy liner



Constructed Stove

*Figure 1: Stove design*

The fuel-efficient cooking stove technology has been tested independently in accordance with the “*Stove Manufacturers Emissions & Performance Test Protocol (EPTP)*”<sup>5</sup> and certified by the Engines and Energy Conversion Laboratory at Colorado State University<sup>6</sup> for its thermal efficiency. More information on this test and the procedures followed is available in Annex 3.

The liner, insulation, pot rest and metal grate will be manufactured in a specialist stove factory to ensure standardised production. All other components, including bricks and mortar, will be produced locally in Zambia.

The stove will be constructed according to a standardized design and construction procedure by Zambian installation teams. Teams responsible for the construction of stoves in each CPA will be trained accordingly. The trained stove builders will receive a stove kit that they assemble on site. A separate Operations Plan and Installation Process details how individual households will receive stoves and the timescale for each CPA’s implementation.

The replacement of the fuel efficient stoves, described above, for a more efficient version will only be possible if the crediting period of the PoA is renewed at the end of the existing crediting period. A more efficient stove will require the baseline data to be changed and this will require additional validation. The technology described above is state-of-the-art and designed as a bespoke solution for Zambia. A more efficient technology would require considerable additional research and development over a period of time.

**(c) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.);**

Stoves first ordered: 22/12/2010  
 Installation of first stove: 06/06/2011  
 Registration of PoA: 28/01/2013

**(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period.**

27,972

<sup>5</sup> Stove Manufacturers Emissions & Performance Test Protocol (EPTP): A protocol for testing stove fuel efficiency and emissions and a standard for improved stoves; Defoort, L’Orange, Kreutzer (EECL), Lorenz (Envirofit), Kamping (Philips) 2009

<sup>6</sup> Please see EECL “Statement of Qualifications”

**A.2. Location of project activity**

The technologies included in the project are installed in numerous locations (identified by individual GPS locations) within the Host Party country of Zambia.

**A.3. Parties and project participant(s)**

Party involved((host) indicates a 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)
Zambia (host)	Private Entity: 3 Rocks Ltd.	No

**A.4. Reference of applied methodology**

AMS II.G *Energy efficiency measures in thermal applications of non-renewable biomass, Version 3*

Ref:

<http://cdm.unfccc.int/methodologies/DB/REQC2MYZJJ6I7BC9SKCS32T2K87AOW>

Tools used:

Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 03.0

Ref:

[https://cdm.unfccc.int/Reference/Standards/meth/meth\\_stan05.pdf](https://cdm.unfccc.int/Reference/Standards/meth/meth_stan05.pdf)

Standard for the Development of Eligibility Criteria for the Inclusion of a Project Activity as a CPA under the POA, version 03.0

Ref:

[http://cdm.unfccc.int/filestorage/e/x/t/extfile-20130729142721867-meth\\_stan04.pdf/meth\\_stan04.pdf?t=U218bXVnZjByfDAIEh1ns7nQdLueIR0cJmw8](http://cdm.unfccc.int/filestorage/e/x/t/extfile-20130729142721867-meth_stan04.pdf/meth_stan04.pdf?t=U218bXVnZjByfDAIEh1ns7nQdLueIR0cJmw8)

Guidelines on the Demonstration of Additionality of Small-Scale Project Activities, version 09.0

Ref:

[http://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC\\_guid05.pdf](http://cdm.unfccc.int/Reference/Guidclarif/meth/methSSC_guid05.pdf)

**A.5. Crediting period of project activity**

Type: Renewable

Start date: 28/01/2013

Length: 7 years

**SECTION B. Implementation of project activity****B.1. Description of implemented registered project activity**

Fuel Efficient Stoves in Zambia (3RL CPA No. 01) is fully implemented, with 15,938 stoves installed in households in Zambia at the date of inclusion (28/01/2013). The starting date is 22/12/2010, which is the date of commencement of 'real action' in the CPA. This date has been selected as it is the date when the first stoves were ordered under the CPA.

The crediting period commenced on 28/01/2013 and all stoves were installed by this date, meaning the CPA is fully implemented by the start of the crediting period.

Only one Monitoring Report is submitted for this monitoring period, as only one CPA is included in the PoA (3RL CPA No. 01).

## **B.2. Post registration changes**

### **B.2.1. Temporary deviations from registered monitoring plan or applied methodology**

No request for deviation has been applied for this monitoring period.

### **B.2.2. Corrections**

No correction has been made.

### **B.2.3. Permanent changes from registered monitoring plan or applied methodology**

There are no permanent changes from the registered monitoring plan or applied methodology.

### **B.2.4. Changes to project design of registered project activity**

There are no changes to the project design of the registered project activity.

### **B.2.5. Changes to start date of crediting period**

There are no changes to the start date of the crediting period.

### **B.2.6. Types of changes specific to afforestation or reforestation project activity**

n/a

## **SECTION C. Description of monitoring system**

CPAs included in this PoA will be homogenous in nature, as they are applying a common technology and the technology will have common usage patterns. The commonality of usage patterns was demonstrated during the baseline surveys of woodfuel usage and the technology is a specific response to this usage (i.e. biomass fuel utilized on a 3 stone fire solely for household purposes).

In accordance with EB69 Annex 4 Guidance: STANDARD FOR SAMPLING AND SURVEYS FOR CDM PROJECT ACTIVITIES AND PROGRAMME OF ACTIVITIES; sampling activities will be undertaken at the PoA-level and the sampling plan presented here will apply to the group of CPAs to be included in the PoA. To comply with the guidelines and the methodology, samples will be calculated on either on a 95/5 confidence/precision basis for biennial surveys or 95/10 for annual surveys, to comply with monitoring requirements for a group of CPAs (EB69, Annex 4).

In accordance with the Sampling Standard<sup>7</sup> the parameter values for (1) the stove usage rate, and (2) the stove efficiency are estimated by sampling in accordance with the requirements in the applied methodology using a single sampling plan covering a group of CPAs<sup>8</sup>, applying either a 95/10 for annual or 95/5 for biennial confidence/precision for the sample size calculation. A single sampling plan covering a group of CPAs is justified when either the homogeneity of included CPAs relative to the parameters of interest can be demonstrated or the differences among the included CPAs is taken into account in the sample size calculation.

Therefore, a single sampling plan is justified as the proposed PoA involves CPAs that are homogenous and there is homogeneity related to parameters of interest, as described below:

Stove usage rate (ASG) parameter of interest:

- Every CPA has the same stove technology user profile (i.e. domestic households)
- Every CPA employs the same stove technology
- The baseline survey shows that household usage of fuel wood and cooking technology (i.e. 'three rocks' method) in Zambia is homogenous across regions

Stove efficiency (SESG) parameter of interest:

- Every CPA employs the same stove technology
- Each final constructed stove is robust, manufactured to identical standards and with no moving parts, and therefore efficiency is designed to remain constant over time
- Every CPA applies the same stove installation process and therefore each stove is an exact replica of all the others in similar (i.e. domestic household) locations
- Every CPA has the same Implementing Entity, meaning each stove is installed and monitored in the same manner

Therefore as the technology and construction of each stove is homogenous, every CPA is homogenous relative to the stove efficiency<sup>9</sup>

Thus a single sampling plan covering a group of CPAs is justified. The only relevant difference between CPAs arises from the date of installation of stoves. To take account of this, a number of measures have been employed for monitoring the overall average performance of stoves included in the PoA and for accurately calculating their emissions reductions:

- 1) A simple random sample is selected from all stoves included the PoA, regardless of installation date in the monitoring database, for both parameters of interest
- 2) Emissions Reductions are calculated on a per stove per day basis, by counting the number of operating days of each stove from the date of installation and aggregating the emissions reductions, applying the homogenous stove usage rate obtained through sampling for all

<sup>7</sup> Standard for sampling and surveys for CDM project activities and programme of activities, EB69 Annex 4, para 20 (including footnote 18)

<sup>8</sup> That is, the populations of all CPAs in the group are combined together, the sample size is determined and a single survey is undertaken to collect data

<sup>9</sup> Even if efficiency were to deteriorate slightly over time, a simple random sample would still find the correct average efficiency

stoves

- 3) Emission Reductions are calculated applying the homogenous stove efficiency obtained through sampling for all stoves. The same efficiency is applied regardless of the date of installation, giving an accurate picture of average stove usage and efficiency across the PoA. Thereby, the differences in installation date are taken into account by monitoring a simple random sample of all stoves and averaging performance in the emission reduction calculations<sup>10</sup>
- 4) The sample sizes for the stove usage rate and stove efficiency are calculated conservatively

These measures, combined with the high degree of homogeneity between CPAs, means that the application of a single sampling plan covering a group of CPAs is justified in line with the Sampling Standard.

Stoves installed under each CPA will have a CPA identifier tag in the PoA monitoring database.

Emissions reductions generated by CPAs included in the PoA will be monitored by 3RL via the monitoring database and through the implementation of this monitoring plan, using a sampling technique where indicated. Emissions reductions for each CPA will be calculated using the data contained in the monitoring database and from the monitoring surveys. A monitoring report describing monitoring activities and calculated emissions reductions will be produced for each monitoring period.

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante or at renewal of crediting period

<b>Data / Parameter:</b>	<i>B<sub>old</sub></i>
Unit:	Tonnes per annum
Description:	Quantity of biomass used in absence of the project activity
Source of data:	Baseline survey
Value(s) applied:	$(4.1 * 15,938) = 65,345$
Purpose of data:	Calculation of baseline emissions
Additional comment:	See PoA-DD

<b>Data / Parameter:</b>	$\eta_{new}$
Unit:	Fraction
Description:	Thermal efficiency of the stove
Source of data:	Stove Manufacturers Emissions & Performance Test Protocol (EPTP) Certificate
Value(s) applied:	0.295
Purpose of data:	Calculation of baseline emissions
Additional comment:	See PoA-DD

<sup>10</sup> The monitoring report will show the correlation between stove efficiency and the year (or 'vintage') of installation, proving that the sample is homogenous. In the unlikely scenario where the sample is shown not to be homogenous in this regard, a stratified approach to analyzing the data will be applied and emissions reductions per stove will be calculated according to the vintage of installation.



<b>Data / Parameter:</b>	$f_{NRB,y}$
Unit:	Fraction
Description:	Non-renewable biomass usage in Zambia, as a proportion of total biomass usage
Source of data:	EB 67 country-specific default value for Zambia
Value(s) applied:	0.81
Purpose of data:	Calculation of baseline emissions
Additional comment:	See PoA-DD
<b>Data / Parameter:</b>	$\eta_{old}$
Unit:	Fraction
Description:	Efficiency of 3-rock fire cooking method (system being replaced)
Source of data:	Methodology default
Value(s) applied:	0.10
Purpose of data:	Calculation of baseline emissions
Additional comment:	
<b>Data / Parameter:</b>	$NCV_{biomass}$
Unit:	TJ/tonne
Description:	Net calorific value of the non-renewable woody biomass that is substituted
Source of data:	IPCC default
Value(s) applied:	0.015
Purpose of data:	Calculation of baseline emissions
Additional comment:	
<b>Data / Parameter:</b>	$EF_{projected\_fossilfuel}$
Unit:	tCO <sub>2</sub> /TJ
Description:	Emission factor: substitution of non-renewable biomass by similar consumers
Source of data:	Methodology default
Value(s) applied:	81.6
Purpose of data:	Calculation of baseline emissions
Additional comment:	
<b>Data / Parameter:</b>	$L_y$
Unit:	Fraction
Description:	Leakage
Source of data:	Methodology default
Value(s) applied:	0.95
Purpose of data:	Calculation of baseline emissions

Additional comment:	
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<b>Data / Parameter:</b>	<i>DRB</i>
Unit:	Tonnes
Description:	Demonstrably renewable biomass
Source of data:	<i>fNRB,y</i> baseline study
Value(s) applied):	1,278,025
Purpose of data:	Calculation of baseline emissions
Additional comment:	

## D.2. Data and parameters monitored

<b>Data / Parameter:</b>	<i>NS</i>
Unit:	Number
Description:	Number of stoves still operation during the monitoring period
Measured/ Calculated / Default:	Measured
Source of data:	Installation data and monitoring survey
Value(s) of monitored parameter:	15,938
Monitoring equipment:	PoA monitoring database
Measuring/ Reading/ Recording frequency:	Annually or Biennially
Calculation method (if applicable):	<p>Annually or biennially, a simple random sample of installed stoves will be selected from the monitoring database to determine if they are still operating or are replaced by an equivalent in service appliance. The activity sample group (ASG) will be selected based on a 95% level of confidence. The margin of error will be 5% for biennial surveys and 10% for annual surveys, in accordance with the methodology and EB69 Annex 4 &amp; 5 Guidance.</p> <p>The total number of stoves in operation compared to the total number of stoves installed (according to the installation records in the monitoring database) will be surveyed. Stoves in operation in the Activity Sample Group (ASG) will be counted during each monitoring period to derive an attrition rate (expressed as a percentage) and this percentage deduction will be applied to the total number of stoves operating.</p>

QA/QC procedures:	<p>The unique reference number of each stove shall be logged in the monitoring database showing the total number of stoves. Data from the ASG will be collected either annually or biennially and applied to the emissions reductions calculations during that period.</p> <p>In case of any variation between the installation data and the ASG monitoring data, a larger sample may be selected to ensure greater accuracy.</p> <p>During the first annual or biennial period, the initially installed number of stoves, as indicated by the monitoring database, will apply for interim monitoring reports.</p>
Purpose of data:	Calculation of emissions reduction in the monitoring period
Additional comment:	
<b>Data / Parameter:</b>	<i>OD</i>
Unit:	Days
Description:	Total stove operating days in monitoring period
Measured/ Calculated / Default:	Calculated
Source of data:	Installation and monitoring survey data in monitoring database
Value(s) of monitored parameter:	3,999,766
Monitoring equipment:	PoA monitoring database
Measuring/ Reading/ Recording frequency:	Annually or Biennially
Calculation method (if applicable):	The number will be calculated by counting the number of days from the installation date of each stove until the end of the monitoring period and aggregating the total days. This number will be calculated net of any stove attrition rate identified in the ASG survey.
QA/QC procedures:	The unique reference number of each stove shall be logged in the monitoring database. The date of installation shall be utilized to determine the portion of the monitoring period that the stove has been in operation. Any interruption in the stoves' operation (e.g. where stoves are replaced or drop out) will register as missed operating days in the monitoring database for emissions calculation purposes.
Purpose of data:	Calculation of emissions reduction in the monitoring period
Additional comment:	
<b>Data / Parameter:</b>	$\eta_{new,i}$
Unit:	Fraction
Description:	Thermal efficiency of the stove

Measured/ Calculated / Default:	Measured
Source of data:	Stove manufacturers' Emissions & Performance Test Protocol (EPTP) test
Value(s) of monitored parameter:	0.295
Monitoring equipment:	Thermometer, Moisture content analyzer, stopwatch
Measuring/ Reading/ Recording frequency:	Annually or Biennially
Calculation method (if applicable):	Annually or biennially, a sample of stoves will be tested for their thermal efficiency to ensure that they are still operating at the specified efficiency. The total number of stoves to be selected for efficiency monitoring will be a simple random sample of installed stoves which are in operation. The stove efficiency sample group (SESG) will be selected based on a 95% level of confidence. The margin of error will be 5% for biennial surveys and 10% for annual surveys, in accordance with the methodology and EB69 Annex 4 & 5 Guidance.
QA/QC procedures:	Tests will be undertaken by experienced project staff following the Stove Manufacturers Emissions & Performance Test Protocol (EPTP) <sup>11</sup> . Staff will follow the procedure used in the EPTP and record the thermal efficiency of each stove tested, which will be subsequently uploaded to the monitoring database for emissions calculation purposes. Any variation from the baseline efficiency will be applied to the emissions calculations in the monitoring reports. In the case of any variation in efficiency from the baseline, a larger sample of stoves may be selected to ensure greater accuracy. During the first annual or biennial period, the baseline tested figure will apply for interim monitoring reports.
Purpose of data:	Calculation of emissions reduction in the monitoring period
Additional comment:	
<b>Data / Parameter:</b>	$B_{new}$
Unit:	Tonnes per annum
Description:	Quantity of biomass saved per stove per annum
Measured/ Calculated / Default:	Calculated
Source of data:	Monitoring survey

<sup>11</sup> Stove Manufacturers Emissions & Performance Test Protocol (EPTP): A protocol for testing stove fuel efficiency and emissions and a standard for improved stoves; Defoort, L'Orange, Kreutzer (EECL), Lorenz (Envirofit), Kamping (Philips) 2009

Value(s) of monitored parameter:	2.71
Monitoring equipment:	ER calculation sheet
Measuring/ Reading/ Recording frequency:	Annually or Biennially
Calculation method (if applicable):	<p>Annually or biennially, a simple random sample of installed stoves will be selected from the monitoring database to determine if they are still operating or are replaced by an equivalent in service appliance. The activity sample group (ASG) will be selected based on a 95% level of confidence. The margin of error will be 5% for biennial surveys and 10% for annual surveys, in accordance with the methodology and EB69 Annex 4 &amp; 5.</p> <p><i>Bnew</i> monitoring shall ensure that:</p> <p>(a) Either the replaced low efficiency appliances are disposed of and not used within the boundary or within the region; or</p> <p>(b) If baseline stoves continue to be used, monitoring shall ensure that the fuel-wood consumption of those stoves is excluded from <i>Bold</i>.</p> <p>The ASG survey will check the presence of domestic 3-rock fires in the household of stove recipients and the survey questionnaire will be used to ascertain the patterns of usage of each appliance. An average proportion of usage of 3 rock fires shall then be calculated across the ASG and a deduction made to <i>Bold</i>, where appropriate.</p>
QA/QC procedures:	<p>The latest version of the survey form “3RL Activity Monitoring Survey” will be used to gather data on patterns of appliance usage for each survey participant. Where residual use of 3 rock fires is found in the ASG, the proportion of usage will be derived as a fraction and applied as a correction factor to <i>Bold</i>.</p> <p>In case of any variation from <i>Bold</i> a greater sample size may be selected for increased accuracy.</p> <p>During the first annual or biennial period, the baseline figure will apply for interim monitoring reports.</p>
Purpose of data:	Calculation of emissions reduction in the monitoring period
Additional comment:	

### D.3. Implementation of sampling plan

The sampling plan was not implemented as the stove usage rate and stove efficiency parameters of interest are not monitored for this monitoring period. The methodology states that these parameters must be monitored either annually or biennially. As this monitoring period does not constitute a full year of operation, monitoring has not yet been undertaken.

Furthermore, the registered PDD states the following for each parameter:

*NS* - During the first annual or biennial period, the initially installed number of stoves, as indicated

by the monitoring database, will apply for interim monitoring reports.

$\eta_{new,l}$  - During the first annual or biennial period, the baseline tested figure will apply for interim monitoring reports.

$B_{new}$  - During the first annual or biennial period, the baseline figure will apply for interim monitoring reports.

## SECTION E. Calculation of emission reductions or GHG removals by sinks

### E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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**Ex-Ante** baseline emissions reductions are calculated as follows:

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

Where:

1.  $B_{y,savings}$  Quantity of woody biomass that is saved per stove per annum in tonnes. The formula for calculating this is:  $B_{old} * (1 - \eta_{old} / \eta_{new})$  (calculated on an ex-ante basis at 2.71 tonnes per household per annum)
2.  $f_{NRB,y}$  The fraction of biomass used in absence of the project that is non-renewable (0.81).
3.  $NCV_{biomass}$  Methodology default (0.015 TJ/tonne)
4.  $EF_{projected\_fossilfuel}$  Methodology default (81.6 tCO<sub>2</sub>/TJ)
5.  $B_{old}$  Average quantity of woody biomass used per stove per annum in absence of the project (4.1 tonnes per household per annum baseline survey, see Annex 3)<sup>12</sup>
6.  $\eta_{old}$  Methodology default (0.10)
7.  $\eta_{new}$  Thermal efficiency of the new appliance (0.295 baseline EPTP test, see Annex 3)
8.  $L_y$  Methodology default (0.95)

**Ex-ante** ER calculation (per stove):

$B_{old}$	t/annum	Baseline survey	4.1
$\eta_{old}$	fraction	Methodology default	0.1
$\eta_{new}$	fraction	Baseline EPTP test	0.295
$B_{y,savings}$	t/annum	Calculated	2.71
$f_{NRB,y}$	fraction	EB default	0.81
$NCV_{biomass}$ (TJ/t)	TJ/t	Methodology default	0.015
$EF_{projected\ fossil\ fuel}$	tCO <sub>2</sub> /TJ	Methodology default	81.6
<b>ER<sub>y</sub></b>	<b>t CO<sub>2</sub></b>		<b>2.69</b>

A maximum of 15,938 stoves will be included in the proposed CPA, as per the methodology savings threshold of 180GWh<sup>13</sup>.

<sup>12</sup> Methodology Option A selected: Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year). This can be derived from historical data or a survey of local usage.

<sup>13</sup> Please refer to the Emissions Reductions Calculation Sheet for details

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	42,825	0	2,141	40,684
Year 2	42,825	0	2,141	40,684
Year 3	42,825	0	2,141	40,684
Year 4	42,825	0	2,141	40,684
Year 5	42,825	0	2,141	40,684
Year 6	42,825	0	2,141	40,684
Year 7	42,825	0	2,141	40,684
<b>Total</b>	<b>299,775</b>	<b>0</b>	<b>14,987</b>	<b>284,788</b>
<b>Total number of crediting years</b>	7			
<b>Annual average over the crediting period</b>	42,825	0	2,141	40,684

## E.2. Calculation of project emissions or actual net GHG removals by sinks

There are no project emissions attributable, as per the registered PDD.

## E.3. Calculation of leakage

Leakage is calculated by using the methodology default value of 0.95.

## E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO <sub>2</sub> e)
<b>Total</b>	29,445	0	1,472	27,972

## E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
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<b>Emission reductions or GHG removals by sinks (t CO<sub>2</sub>e)</b>	40,684	27,972
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#### E.6. Remarks on difference from estimated value in registered PDD

The Emissions Reductions presented in this Monitoring Report reflect the partial calendar year duration of the monitoring period (28/01/2013 – 14/10/2013) whereas those values presented in the PDD reflect a full calendar year of crediting.

#### E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

<b>Item</b>	<b>Actual values achieved up to 31 December 2012</b>	<b>Actual values achieved from 1 January 2013 onwards</b>
<b>Emission reductions or GHG removals by sinks (t CO<sub>2</sub>e)</b>	0	27,972

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#### Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net anthropogenic GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	28 May 2010	EB 54, Annex 34. Initial adoption.

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