**MONITORING REPORT FORM (FCDMMR)**

**Version 02.0**

# MONITORING REPORT

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|---|---|
| **Title of the project activity** | Integrated Biomass Energy Conservation Project, Malawi |
| **Reference number of the project activity** | Gold Standard 613 |
| **Version number of the monitoring report** | Version 5 |
| **Completion date of the monitoring report** | June 26, 2013 |
| **Registration date of the project activity** | 1/10/2010 |
| **Monitoring period number and duration of this monitoring period** | Monitoring period number 3 - October 2, 2011 to October 1, 2012 (inclusive of both dates). |
| **Project participant(s)** | Hestian Innovation Ltd. |
| **Host Party(ies)** | Malawi |
| **Sectoral scope(s) and applied methodology(ies)**Scope 3 - Energy demand<br><br>Methodology: Gold Standard Technologies and Practices to Displace Decentralised Thermal Energy Consumption version 1.0 | |
| **Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD** | 77,630 VERs for year 4 (24/11/2011 – 23/11/2012) as per registered PDD Version 6 |
| **Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period** | 77,610 VERS for year 2/10/2011 to 1/10/2012 (inclusive of both dates). |

## SECTION A. Description of project activity

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

The project reduces greenhouse gas emissions from non-renewable biomass fuel by dissemination of improved cook-stoves and fuel-efficient rocket barns to replace existing inefficient stoves and curing barns.

This Monitoring Report applies to five technologies, namely: (1) Portable Ceramic Stoves; (2) Fixed Esperanza Stoves; (3) Rocket Barns; (4) Institutional Cook Stoves and (5) Urban Cook Stoves.

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|  |  |  |  |  |
| (1) Portable ceramic stove | (2) Fixed *esperanza* stove | (3) Rocket Barn | (4) Institutional Cook Stove | (5) Urban Cook Stove |

The project activity involves progressive installation of four types of improved cook stoves and improved tobacco curing 'rocket barns'. Kitchen Surveys and Aging Tests have been conducted for all of the fuel-efficient devices.

This Monitoring Report covers:

1. Portable Ceramic Stoves (PCS);
2. Fixed Esperanza Stoves (FES);
3. Rocket Barns (RB);
4. Institutional Cook Stoves (ICS); and
5. Urban Cook Stoves (UCS).

Benefits of this project include reduced exposure to indoor air pollution as well as relief from high fuel costs, less time spent hand-gathering domestic fuel-wood and reduced burden for farmers to transport wood over distances that are increasing. Public benefits of the devices promoted come in the form of reduced pressure on Malawi's natural resources.

During the current monitoring period of 02/10/2011 to 01/10 2012 (inclusive of both dates) it is calculated that 77,610 tons of CO2eq have been generated.

### A.2 Location of project activity

The project has activities in all the three regions of Malawi i.e. Northern, Southern and Central regions.

### 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) |
|---|---|---|
| Malawi (host) | Hestian Innovation Ltd. | No |

### A.4 Reference of applied methodology

Please see revised monitoring plan.

The project follows the Gold Standard Methodology "technologies and practices to displace decentralised thermal energy consumption", (11/04/2011).

### A.5 Crediting period of project activity

The current crediting period for the project is November 24, 2008 to November 23, 2015 (both days included).

## SECTION B. Implementation of project activity

### B.1 Description of implemented registered project activity

The project activity has disseminated Portable Ceramic Stoves (PCS), Fixed Esperanza Stoves (FES), Rocket Barns (RB), Institutional Cook Stoves (ICS) and Urban Cook Stoves (UCS) as detailed in the box below with a calculated GHG offset of 77,610 tons generated during the monitoring period.

| | 24/11/2008 to 01/10/2009 | 2/10/2009 to 01/10/2010 | 02/10/2010 to 01/10/2011 | 02/10/2011 to 01/10 2012 | Total |
|---|---|---|---|---|---|
| PCS | 1,767 | 5,308 | 5,839 | 1,709 | 14,623 |
| FES | 0 | 1,524 | 862 | 0 | 2,386 |
| RB | 153 | 588 | 211 | 0 | 952 |
| ICS | 0 | 1 | 30 | 0 | 31 |
| UCS | 0 | 51 | 204 | 0 | 255 |

***Devices sold generating emission reductions:***

Note:

1. Documented replacement and additional PCS stoves, totaling 112 and 643 respectively, are neither included in the table above nor are considered for ER calculations. In MP3, the stove lifespan approach was taken based on the mean number of months when 50% of the original stoves are in use to consider both new and replacement stoves. Households that purchase more than one stove are only accounted for one. Therefore, no additional or replacement stoves were counted in MP3.
2. Zero sales reflected for FES, RB, ICS and UCS as GS613's small scale limit is reached by including PCS sales up to December 5, 2011. Devices which were sold in MP3 but are not included in MR3 will either be grouped into a new project or will be included as necessary for MR4, with the understanding that the emission reductions those devices would have generated in monitoring period 3 cannot be claimed in monitoring period 4.

In parallel with sales of stoves and barns, a rigorous monitoring of the project activity has been ongoing per schedule below:

| **Date** | **Activity** | **Purpose** |
|---|---|---|
| October 2, 2011 to October 1, 2012 | Sales recording | Establish sales database to track number |

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| | | of devices sold and determine clusters for kitchen / barn surveys |
| Ongoing | Non-Renewable Biomass – monitoring for official credible publicly available value | Determine percentage of non- renewable biomass |
| 30th of April to 18th of May, 2012 (RB) | Barn Usage & Monitoring Surveys (RB) | Determine if clusters are still representative. To establish drop-off rates in RB performance & other relevant factors in aging RB. |
| 30th of April to 18th of May, 2012 (FES) | Usage & Monitoring Surveys (FES) | Determine if clusters are still representative. To establish drop-off rates in FES performance & other relevant factors in aging FES. |
| 7-20 May, 2012<br>22 January – 12 March, 2013 | Aging Stove Tests – Water Boiling Tests (FES, UCS, PCS) | To measure efficiency changes for aging stoves (FES, UCS, PCS). |
| 8 to 10th of May 2012; 16th to 30th of June 2012; and 5th to 13th December 2012 (PCS) | Monitoring Surveys (PCS) | Determine if clusters are still representative. |
| 17th December to 20th December, 2012 (UCS) | Usage & Monitoring Surveys (UCS) | Determine if clusters are still representative. To establish drop-off rates in UCS performance & other relevant factors in aging UCS. |
| 16th to 22nd November, 2012 and 29th January to 4th February 2013 (ICS) | Usage & Monitoring Surveys (ICS) | Determine if clusters are still representative. To establish drop-off rates in ICS performance & other relevant factors in aging ICS. |
| February 20 – 22, 2013 (PCS) | Usage Surveys (PCS) | To establish drop-off rates in PCS performance & other relevant factors in aging PCS, to establish the average lifespan of the PCS. |

Based on lessons learnt from the Second Verification Report, Monitoring Surveys have been revised for greater ease of understanding, and enumerators have been trained accordingly to effectively gather information on the predominant source of fuel for cooking. This was done to avoid confusion about the project cluster definitions with respect to wood being the predominant source of fuel in cases where households may occasionally use crop residues or other types of solid biomass and can be referenced in annexes of the monitoring reports.

If future kitchen surveys yield different results, a new cluster shall be formed and a new baseline shall be established and validated.

**B.2 Post registration changes**

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

N/A

### B.2.2. Corrections

N/A

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

N/A

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

On 31/10/12 the GSF approved PP's request to change the scale of the project from Large Scale to Small Scale.

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

N/A

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

N/A

## SECTION C. Description of monitoring system

**Monitoring equipment:**

The following instruments are used to conduct Water Boiling Tests on stoves of each age group to determine if stoves become less efficient over time – a factor which is taken into account in the calculation of project emission reductions.

| *Equipment* | *Manufacturer* | *Type* | *Accuracy* |
|---|---|---|---|
| Wood humidity measuring device | Voltcraft<br><br>FM-300 | Moisture measuring range 6% to 99.9% | ±1% (in moisture range 6% ~ 40%). |
| Digital hand thermometer | Voltcraft<br><br>K 101 thermometer | Measuring range -200°C to +1370°C (reversible °C/°F) | -200°C to +200°C<br><br>accuracy of 0.3% of the display, +1 °C |
| Digital high precision scale | My Weigh KD-8000 | 8 kg capacity digital weighing scale | Accuracy of 1g |

**Table 1: Equipment used for Water Boiling Tests**

The calibration of the monitoring equipment for project emission parameters is checked by enumerators as per the equipment's operating instructions, prior to conducting tests. The hand thermometer, for example, is calibrated in the factory. For precise measurements the hand thermometer can be set to the respective temperature sensor. The temperature sensor is held in a container of icy water (0°C). The hand thermometer's display is checked after approximately one minute. If it does not read 0°C it can be correctly set by turning the offset calibration screw[1].

1 The digital hanging scales, the wood humidity measuring device and digital hand thermometer that the project use are manufactured by Voltcraft©. Lindenweg 15, D-92242 Hirschau/Duitsland Tel. +49 180/586 582 7

**Involvement of Third Parties:**

Continuous monitoring is being performed by Area 55, a newly formed company that has replaced Hestian Rural Innovation Development as Project Implementer as of July 1, 2012, and external consultants.

**Data concerning double counting:**

The project continues to monitor any risks of double counting in this project, specifically determining whether any of the stoves sold as part of this project are counted in any other emission reduction projects. At this time, to the best of our knowledge there are no other registered greenhouse gas emission reduction projects in Malawi involving stoves or barns, and thus today no risk of double counting exists.

However, the project developers continue to monitor whether any other projects exist. In such cases, the project developer will cross reference our total sales database and end user database with any other projects to ensure that there is no overlap. In addition, the project continues to use all legal documentation outlined in the PDD to ensure legal ownership over offsets, a step that further avoids double counting.

**Data processing and archiving (incl. software used):**

Sales records and results of monitoring surveys are first captured in paper form then compiled in a Microsoft Excel spreadsheet. Records will be kept for two years after the project activity is completed. Monitoring data is analysed using Microsoft Excel and SPSS (Software Package for Social Sciences).

**Special event log:**

No special events have occurred since the last verification report.

**Quality assurance and quality control measures**

Quality control tools were developed for the Chitetezo Mbaula and are used in stove trainings. During training, producers are instructed not to 'fire' stoves which are not of the correct specifications. Further to this, retailers individually inspect the stoves before purchasing from the producer and substandard stoves are not purchased, which acts as a further internal quality control. In event of problems with the larger technologies, the rocket barn and institutional cook stoves, the warranty system explained under 'Roles and Responsibilities' applies.

**Documented procedures and management plan:**

A simplified monitoring plan has been developed by the project coordinator, which aims to build capacity of project managers and their field staff in line with monitoring tasks outline roles and responsibilities documented below.

**Roles and responsibilities:**

The Project Coordinator assists the project implementing and monitoring body Area 55 and the specific project managers to maintain and make available accurate records. The Project Coordinator collates a composite electronic Total Sales record and Area 55 keeps back-up paper records. The existing accounting and records system accurately tracks sales, inventories and supply and purchases. Area 55 maintains a full sales database in Excel of all sales that take place, listed according to the sales mechanism, date, device, type etc. Sales databases are cross-checked with production records and other data to ensure consistency and accuracy.

Area 55 has implemented a limited warranty system for the rocket barn and institutional cook stoves.

(www.voltcraft.de). The 8 kg capacity high precision scales is used for conducting water boiling tests and is manufactured by My Weigh (www.myweigh.com), with a 1g of accuracy, had a professional factory calibration test on 20/01/2012 and does not normally new recalibration during its 30 year warranty. Self calibration instructions are included in KD-8000 manual.

End user information is collected through direct sales to end-users by retailers or agents of the project and is contained in warranty and / or emission reduction contract. This information is collated into an electronic database from which project monitoring can be conducted. The database and excel records are backed up and sent to the project coordinator for checking prior to using them as the basis for quarterly monitoring activities. Hard copies of ER contracts and warranty are filed as additional backup and for verification purposes. During the next year, the Project Implementer and / or Coordinator will begin to scan these paper records to prevent any losses in case of emergencies such as fire/theft.

Direct sales to end-users information is collected by Area 55's agents, who are issued with contract forms in advance and submit the forms to the relevant project manager. The customers in the sales record for which phone numbers or addresses are available are used for survey sampling to support the periodic monitoring activities.

Monitoring tasks, such as monitoring surveys, assessment of leakage and other such tasks are managed by the project managers in collaboration with the project coordinator, who are best capable of collecting this data because they know the technology and the end-users best.

It is important to note that monitoring surveys are not used directly in ER calculations, but instead serve to inform whether new clusters are required (which could in turn effect ER calculations) and monitor certain Gold Standard sustainability indicators. Surveys are organised by external 3rd party consultant(s) and / or Area 55 staff, and new enumerators are trained prior to conducting surveys and tests. Survey and test results are filed in paper at Area 55's office and are analysed using Excel to compile reports. The integrity of data is constantly cross-checked with other variables to ensure consistency and avoid mistakes.

The Project Coordinator monitors that improved cook-stoves or barns do not number more than ten per kitchen / farm. To date no kitchen or farm has more than ten devices, hence the capacity limitation of the applied GS methodology has been met.

**Trainings:**

Area 55 and external consultants recruited enumerators during the baseline study and trained them to conduct surveys and tests. Kitchen Surveys (KS), Barn Surveys (BS), Kitchen Performance Tests (KPTs), Barn Performance Tests (BPTs), Usage Surveys and Aging Stove / Barn Tests are performed by trained enumerators and supervised by relevant project manager. These enumerators perform monitoring activities and report directly to the respective project manager. The Project Coordinator collates the information provided by the respective project managers.

Area 55 and its agents actively train new supervisors, ceramic artisans, specialised builders, metal workers and technicians to be employed by the project. To date, they have trained new artisans in the skills needed to manufacture and market efficient stoves and barns. Training new workers takes 1-6 months, depending on the individual and the skills they are aiming to achieve.

Area 55 prefers to use local enumerators and artisans in different parts of the country because it decreases transport costs and employs local people, which is a benefit to the community and helps strengthen the project's local presence. Households seem to be more comfortable and trustful of local people performing the surveys / tests.

Area 55 and its agents also train end-users on proper use of the stove, as outlined in section below on troubleshooting.

**Involvement of Third Parties:**

Clioma Ltd. - sub-contracted to conduct Usage and Monitoring Surveys for stoves and barns.

Dr. Wilson Jere and Amulike Msukwa from Bunda College, University of Malawi have provided the Project with assistance in statistical analysis of the usage and monitoring surveys for all technologies and the adjusted adult meals for ICS.

**Internal audits and control measures:**

The volume of devices sold is the basis to determining the emissions reductions. Respective project managers manage their sales records, project database and information on sustainable development indicators, and forward them to the project coordinator.

Area 55 and its agents are subjected to financial audits under Malawi law.

**Troubleshooting procedures:**

Troubleshooting procedures (as commonly understood) do not apply to this project.

The following measures improve the lifetimes of the technologies and help to maintain efficiency:

(1) Area 55 and its agents provide user-training to each and every end-user on how: (i) to operate the devices (i.e. user training) (ii) to improve kitchen / barn management and (iii) to improve firewood management. Producers and builders are trained on production techniques and design specifications.

(2) Stove users are encouraged to avoid leaving portable stoves out in the rain and protect fixed stoves from the elements. By protecting stoves, their life-span can be extended.

(3) End-users are trained on how to improve firewood management by drying and splitting, firewood before use, by not overloading the furnace or fire chamber with too much fuel and by extinguishing un-used firewood in sand so that it can be used later.

(4) Kitchen management is promoted to reduce exposure to smoke by encouraging improved kitchen ventilation and to improve cooking practices by using a lid while cooking, by soaking beans overnight, by using the hot stove after cooking to heat water for bathing etc.

(5) As part of Surveys, home visits are made as required by the methodology. During these visits, proper use of the stove and firewood and kitchen management is discussed. Area 55 and its agents also follow up with users through its extensive sales network. These visits serve to reinforce proper use principles outlined above.

(6) The project's decentralized production of stoves and barns facilitates after-sales services from producer / contractor to end-user. Some of the troubleshooting and quality assurance measures that are in place include:

- For the PCS, Quality control before and after firing the stoves in a fuel-efficient kiln is performed by trainees of field facilitators that certify the quality of each ceramic stove produced and ascertain the validity of records of the producer groups. The production batch is recorded in the ceramic stove's serial number so that the performance of each batch is monitored.
- For the FES and RB, the end-user certifies by signature that the device has been built to specification to authorise payment.
- The RB and ICS include a two year warranty and health checks including minor maintenance as necessary, which is facilitated by income generated through carbon financing.

(7) The project promotes the adoption of a second stove per household to discourage occasional use of the old stove (i.e. the 3-stone fire) and to facilitate ease of replacement should one of the stoves be damaged or worn out. A second stove is of particular benefit to households with many people as there seems to be a positive relationship between the number of people in household and fuel consumption.

a. PCS adopters are encouraged to purchase 2 stoves at the same time and are given an incentive in the form of "purchase 2 stoves and receive a free tree seedling"
b. Stove promoters of PCS are encouraged to promote at a village level the adoption of 2 stoves.
c. FES builders have been trained on how to build a double-esperanza stove.

The adoption of a second improved cook stove has had the following results to date:

- Number of PCS users with an additional stove – 576 (4.2% of users).[2]
- Number of FES users with an additional stove – approximately 7 out of 100 (7%) of FES end-users in the usage survey in May 2012 had 2 FES in their household.[3]

The Project will continue to tests approaches on how to encourage the adoption of a second stove per household to discourage occasional use of the old stove (i.e. the 3-stone fire) and report on these approaches.

## SECTION D. Data and parameters

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

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|---|---|
| **Data/Parameter** | $P_{B, PCS, 0}$ |
| **Unit** | Kg / household-day |
| **Description** | Quantity of fuel that is consumed in the baseline scenario for PCS |
| **Source of data** | Baseline FT for PCS |
| **Value(s) applied** | 14.35 kg / household day (equivalent to 5.237 t / household year |
| **Purpose of data** | Calculation of baseline emissions for PCS users. |
| **Additional comment** | With the inclusion of baseline data being assessed for suppressed demand the initial fixed baseline data for PCS users (7.02 kg / household day, equivalent to 2.561 tons / household year) was assessed in terms of suppressed demand. The initial baseline survey and test were conducted in April / May before the cold season when households may use more wood for space heating, and just after the rainy season when perhaps more wood is used to compensate for higher moisture content. |

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| **Data/Parameter** | $P_{B, FES, 0}$ |
| **Unit** | Kg / household-day |

2 For PCS, many of the production groups offer warranties where households receive an extra stove for free if their stove has cracked or been damaged within a certain time period. Such stoves are often not recorded in the Total Sales Record. Many of the 600+ stove producers produce stoves for their own use or for their families and neighbours as a gift, loan or repayment, which are often not recorded in the Total Sales Record. It is estimated that dissemination and use of PCS, and associated ERs, are significantly conservative.

3 For FES, households that have adopted a double stove in one kitchen are recorded as one sale.

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|---|---|
| **Description** | Quantity of fuel that is consumed in the baseline scenario for FES |
| **Source of data** | Baseline FT for FES |
| **Value(s) applied** | 14.35 kg / household day (equivalent to 5.237 t / household year |
| **Purpose of data** | Calculation of baseline emissions for FES users. |
| **Additional comment** | For conservativeness, same value applied as derived for suppressed demand calculations for PCS which had an initial fixed baseline significantly lower than the initial fixed FES baseline (original fixed FES baseline was 9.21 kg / household day, equivalent to 3.361 tons / household year). |

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| **Data/Parameter** | $P_{B, UCS, 0}$ |
| **Unit** | Kg / household-day |
| **Description** | Quantity of fuel that is consumed in the baseline scenario for UCS |
| **Source of data** | Baseline FT for UCS |
| **Value(s) applied** | 14.35 kg / household day (equivalent to 5.237 t / household year |
| **Purpose of data** | Calculation of baseline emissions for UCS users. |
| **Additional comment** | For conservativeness, same value applied as derived for suppressed demand calculations for PCS which had an initial fixed baseline lower than the initial fixed UCS baseline (original fixed UCS baseline was 7.91 kg / household day, equivalent to 2.888 tons / household year). |

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| **Data/Parameter** | $P_{B, ICS, 0}$ |
| **Unit** | Kg / adult-adjusted meal |
| **Description** | Quantity of fuel that is consumed in the baseline scenario for ICS |
| **Source of data** | Baseline FT for ICS |
| **Value(s) applied** | 0.3604 kg / adult-adjusted meal |
| **Purpose of data** | This is the initial fixed baseline data for ICS users. |
| **Additional comment** | Baseline data for ICS has not yet been assessed for suppressed demand. |

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| **Data/Parameter** | Person - meal |
| **Unit** | % of person meal or adult-adjusted meal |

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| **Description** | Appropriate weighting for (i) Workforce (male and female), (ii) children's meal (primary school), (iii) 6 year olds and under (pre-primary school) (iv) light meals (e.g. tea). |
| **Source of data** | Baseline FT for ICS; Conversion factors used to estimate Adult Equivalent (AE) are sourced from Government of Malawi, *Impact and output indicators for agriculture, food security, nutrition and natural resources projects/ programmes in Malawi*, July 2008. |
| **Value(s) applied** | Workforce (male and female) meal = 0.90 person meal<br>Children's meals (primary school) = 0.75 person meal<br>6 year olds and under (pre-primary school) = 0.60 person meal<br>Teas = 0.50 person meal |
| **Purpose of data** | This parameter is used to normalise workforce made up of women and men, primary school meals, orphanage meals and light meals (e.g. tea). |
| **Additional comment** | |

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|---|---|
| **Data/Parameter** | $P_{B, RB, 0}$ |
| **Unit** | Kg / kg output |
| **Description** | Quantity of fuel that is consumed in the baseline scenario for RB in 2008 |
| **Source of data** | Baseline FT for RB |
| **Value(s) applied** | 11.96 kg / kg output (equivalent to 15.722 tons / barn year, given average output per Rocket Barn is estimated to be 1,315 kg per season as per the registered PDD V6.0.) |
| **Purpose of data** | This is the fixed baseline data for RB users. RB baseline has not been assessed to date for suppressed demand. |
| **Additional comment** | |

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|---|---|
| **Data/Parameter** | $P_{P, PCS, 2009}$ |
| **Unit** | Kg / household-day |
| **Description** | Quantity of fuel that is consumed in the project scenario for PCS in year 0 (when project PCS were first disseminated). |
| **Source of data** | Measured during Project PFT for PCS in April - May 2009. |
| **Value(s) applied** | 4.29 Kg / household-day (equivalent to 1.566 tons / household year) |
| **Purpose of data** | Used in Suppressed Demand Calculations for PCS and conservatively applied for UCS and FES. |

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| **Additional comment** | Extrapolated savings likely to be conservative as end-users were not yet accustomed to the new technology and are likely to become more efficient with practice.<br>It is appropriate to conduct a PFT in April – May as this is the same season as when the baseline was conducted. |

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| **Data/Parameter** | $P_{P, PCS, 2011}$ |
| **Unit** | Kg / household-day |
| **Description** | Quantity of fuel that is consumed in the project scenario for PCS in year 2 (2 years after project PCS were first disseminated) |
| **Source of data** | Measured during Project PFT for PCS in March - April 2011. |
| **Value(s) applied** | 4.97 Kg / household-day (equivalent to 1.813 tons / household year) |
| **Purpose of data** | Used in Suppressed Demand Calculations for PCS and conservatively applied for UCS and FES. |
| **Additional comment** | The average of $P_{P, PCS, 2009}$ and $P_{P, PCS, 2011}$ are used to estimate the monitored consumption of fuels, which is used to calculate an ex-post evaluation of ERs considering suppressed demand.<br>It is appropriate to conduct a PFT in March – April as this is the same time when the baseline and initial follow-up surveys and tests were conducted. |

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| **Data/Parameter** | $EF_{b, CO2}$ and $EF_{p, CO2}$ |
| **Unit** | $tCO_2$ / t_wood |
| **Description** | $CO_2$ emission factor arising from use of fuels in baseline and project scenarios |
| **Source of data** | 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Tables 1.2/1.4 |
| **Value(s) applied** | 1.7472 tCO2/t wood (=112.0 tCO2/TJ * 0.0156 TJ/ t ) |
| **Purpose of data** | Default IPCC values for wood / wood waste are applied for emission factors required to calculate $CO_2$ emission reductions |
| **Additional comment** | EF in baseline and project have the same value as the project reduces use of the same fuel. |

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| **Data/Parameter** | $EF_{b, nonCO2}$ and $EF_{p, nonCO2}$ |
| **Unit** | $tCO_2$ / t_wood |
| **Description** | Non-$CO_2$ emission factor arising from use of fuels in baseline and project scenarios |

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|---|---|
| **Source of data** | 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.9 in Volume 2: Energy |
| **Value(s) applied** | 0.4554 tCO2/t wood (=(1.224 tCO2/TJ * 0.0156 TJ/ t * 21) + (0.01125 tCO2/TJ * 0.0156 TJ/ t * 310)) |
| **Purpose of data** | Default IPCC values for CH4 and N20 emissions for wood / wood waste are applied. The following GWP100 are applied: 21 for CH4, 310 for N20. |
| **Additional comment** | Both defaults are within a range and the mean of the range is taken as the default. Technical references are from studies in developing country contexts and are more up-to-date than other default values. EF in baseline and project have the same value as the project reduces use of the same fuel. |

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|---|---|
| **Data/Parameter** | $Eff_{b,y}$ |
| **Unit** | % |
| **Description** | Efficiency of the various baseline technologies i |
| **Source of data** | GS methodology default |
| **Value(s) applied** | 10% |
| **Purpose of data** | This is a conservative value that can be confirmed for three stone fires or other baseline stoves using simple boiling tests. |
| **Additional comment** | This parameter is included for *suppressed demand* calculations. |

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| **Data/Parameter** | $Eff_{p,PCS}$ |
| **Unit** | % |
| **Description** | Efficiency of portable ceramic stove (PCS) |
| **Source of data** | Testing the Chitetezo Mbaula. Biomass Research Centre of the Centre for Research in Energy and Energy Conservation (CREEC), Makerere University – College of Engineering, Design, Art and Technology, Kampala, Uganda, August 2012. |
| **Value(s) applied** | 31% |
| **Purpose of data** | Thermal efficiency of PCS that can be compared with efficiency of aging project PCS using simple water boiling tests. |
| **Additional comment** | This parameter is included for *suppressed demand* calculations. |

**D.2. Data and parameters monitored**

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|---|---|
| **Data/Parameter** | fNRB |

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| **Unit** | Percent |
| **Description** | Non-renewability status of woody biomass fuel for the project in monitoring period 2. |
| **Measured/Calculated/ Default** | Default |
| **Source of data** | CDM – SSC WG Thirty fifth meeting report, Annex 20, page 4 (February 2012). |
| **Value(s) of monitored parameter** | 81% |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording Frequency** | Fixed by baseline study for a given crediting period, updated if necessary |
| **QA/QC procedures** | Transparent data analysis and reporting |
| **Purpose of data** | Calculation of baseline emissions. |
| **Additional comment** | 73.82% was the value used in registered PDD Version 3 from Baseline Study conducted by PP (section B.2.2 in PDD); At registration and verification (FAR1) PP asked to be replace fNRB by *"a more actual official credible value as soon as a value is publicly available for the republic of Malawi"*.81% is the value used in registered PDD Version 6, page 25 with confirmation of acceptance by Malawi's DNA, the Environmental Affairs Department, on 15 June 2012 as the default value of non-renewable biomass (fNRB) for the Republic of Malawi. |

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|---|---|
| **Data/Parameter** | $\mathbf{P_{P,\,RB,\,2009}}$ |
| **Unit** | Kg / kg output |
| **Description** | Quantity of fuel that is consumed in the project scenario for RB in year 0 (when project RBs were first disseminated) |
| **Measured/Calculated/ Default** | Measured |
| **Source of data** | Measured during Project PFT for RB in February – April 2009. |
| **Value(s) of monitored parameter** | 4.26 Kg / kg output (equivalent to 5.603 tons / barn-year) |
| **Monitoring equipment** | Generic spring-dial hoist scales (100 kg capacity, precision of 0.5 kg); Measuring tape. |
| **Measuring/Reading/ Recording frequency** | Updated every 2 years, or more frequently |

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| **Calculation method (if applicable)** | Four visits per monitored household in day 0, day 1, day 2 and day 3 to capture data over a 72-hour period. |
| **QA/QC procedures** | Pre-testing conducted to train enumerators; paired tests to minimise external factors, large sample (n=128) used to minimise bias. |
| **Purpose of data** | Calculation of project emissions |
| **Additional comment** | Extrapolated savings likely to be conservative as end-users were not yet accustomed to the new technology and are likely to become more efficient with practice.<br>Barn Tests were conducted during February – April as this is the tobacco season when barns are in use. |

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|---|---|
| **Data/Parameter** | $\mathbf{P_{P,\,RB,\,2011}}$ |
| **Unit** | Kg / kg output |
| **Description** | Quantity of fuel that is consumed in the project scenario for RB 2 years after the first Project PFT (2 years after project RBs were first disseminated) |
| **Measured/Calculated/ Default** | Measured |
| **Source of data** | Measured during Project PFT for RB in February – April 2011. At least 2 recording visits per monitored barn, before after and possibly during the cure, which normally lasts for 4-5 days for a Rocket Barn. |
| **Value(s) of monitored parameter** | 2.797 Kg / kg output (equivalent to 3.679 tons / barn-year) |
| **Monitoring equipment** | Generic spring-dial hoist scales (100 kg capacity, precision of 0.5 kg); Measuring tape. |
| **Measuring/Reading/ Recording frequency** | Updated every 2 years, or more frequently |
| **QA/QC procedures** | Pre-testing conducted to train enumerators; large sample (n=109) used to minimise bias. |
| **Purpose of data** | Calculation of project emissions |
| **Additional comment** | As end-users improve their use of the new technology wood savings increase.<br>Barn Tests were conducted during February – April as this is the tobacco season when barns are in use. |

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| **Data/Parameter** | $\mathbf{P_{P,\,ICS,\,2011}}$ |
| **Unit** | Kg / adjusted adult meal |

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|---|---|
| **Description** | Quantity of fuel that is consumed in the project scenario for ICS in year 0 (when project ICSs were first disseminated) |
| **Measured/Calculated/ Default** | Measured |
| **Source of data** | Measured during Project PFT for ICS in September 2010 – October 2011. |
| **Value(s) of monitored parameter** | 0.0854 Kg / adjusted adult meal |
| **Monitoring equipment** | Generic spring-dial hoist scales (100 kg capacity, precision of 0.5 kg) |
| **Measuring/Reading/ Recording frequency** | Updated every 2 years, or more frequently |
| **Calculation method (if applicable)** | Wood is weighed at the start and the end of each day for three consecutive feeding days. |
| **QA/QC procedures** | Pre-testing conducted to train enumerators; paired tests to minimise external factors, large sample (n=93 (3 days info from 31 institutions)) used to minimise bias.<br>To normalise different types of meals into person-meals or adult equivalent meals, adjustment factors are presented in person meal parameter presented in data and parameters fixed ex-ante above. |
| **Purpose of data** | Calculation of project emissions |
| **Additional comment**PFT for ICS were conducted throughout the year. To comply with methodology recommendations of sampling at least 30 project participants it was over a year before 30 project participants existed and could be tested. | |

| | |
|---|---|
| **Data/Parameter** | $\mathbf{U_{P,\,PCS}}$ |
| **Unit** | Percent |
| **Description** | Single Weighted Usage Parameter for PCS age 0-4<br>Based on cumulative usage rate for technologies in project scenario PCS. Usage of stoves over time to determine project fuel consumption for PCS users. |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | Usage surveys for PCS in March 2013. |
| **Value(s) of monitored parameter** | 69.46% |
| **Monitoring equipment** | |

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| **Measuring/Reading/ Recording frequency** | Annual or more frequently, in all cases on time for any request for Issuance. One Usage Survey per monitored household. |
| **Calculation method (if applicable)** | Usage rates for PCS of each age group taken as percentage of stoves in use with 90 % confidence intervals. A normal linear regression model was fitted to the data to determine the trend.<br>$U_{P, PCS, 0-1}$ = 88.4% (after 7 months)<br>$U_{P, PCS, 1-2}$ = 73.4% (after 18 months)<br>$U_{P, PCS, 2-3}$ = 65.8% (after 38 months)<br>$U_{P, PCS, 3-4}$ = 50.3% (after 47 months)<br><br>Single weighted usage parameter is the sum of products of usage rates and % of total technology days for PCS of each age group:<br>= (% of technology days age 0-1 * 88.4%) + (% of technology days age 1-2 * 73.4%) + (% of technology days age 2-3 * 65.8%) + (% of technology days age 3-4 * 50.3%) |
| **QA/QC procedures** | Pre-testing conducted to train enumerators; large sample (n=197) used to minimise bias. |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | The data was tested for dependency and both the autocorrelation and partial autocorrelation were not significant. Therefore, time series models (autoregressive and moving average models) could not be fit to the data. |

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|---|---|
| **Data/Parameter** | **$U_{P, FES}$** |
| **Unit** | Percentage |
| **Description** | Single Weighted Usage Parameter for FES ages 0-3<br>Based on cumulative usage rate for technologies in project scenario FES. Usage of stoves over time to determine project fuel consumption for FES users. |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | Usage survey for FES in May 2012. |
| **Value(s) of monitored parameter** | 70.00% |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording frequency** | Annual, in all cases on time for any request for Issuance. One Usage Survey per monitored household. |
| **Calculation method (if applicable)** | Percentage of stoves in use with 90 % confidence intervals. A normal linear regression model was fitted to the data to determine the trend. |

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| | $U_{P, FES, 0-1}$ = 86.9% (after 6 months)<br>$U_{P, FES, 1-2}$ = 70.3% (after 18 months)<br>$U_{P, FES, 2-3}$ = 53.7% (after 30 months)<br><br>Single weighted usage parameter is the sum of products of usage rates and % of total technology days for FES of each age group:<br>= (% of technology days age 0-1 * 86.9%) + (% of technology days age 1-2 * 70.3%) + (% of technology days age 2-3 * 53.7%) |
| **QA/QC procedures** | Pre-testing conducted to train enumerators; sufficiently large sample (n=100) used to minimise bias. |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | The data was tested for dependency and both the autocorrelation and partial autocorrelation were not significant. Therefore, time series models (autoregressive and moving average models) could not be fit to the data. |

| | |
|---|---|
| **Data/Parameter** | **$U_{P, UCS}$** |
| **Unit** | Percent |
| **Description** | Single Weighted Usage Parameter for UCS ages 0-3<br>Based on cumulative usage rate for technologies in project scenario UCS. Usage of stoves over time to determine project fuel consumption for UCS users. |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | Usage survey for UCS in December 2012. |
| **Value(s) of monitored parameter** | 32.20% |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording frequency** | Annual or more frequently, in all cases on time for any request for issuance.<br>One Usage Survey per monitored household. |
| **Calculation method (if applicable)** | Percentage of stoves in use<br>$U_{P, UCS, 0-1}$ = 67% (after 6 months)<br>$U_{P, UCS, 1-2}$ = 37% (after 18 months)<br>$U_{P, UCS, 2-3}$ = 13% (after 30 months)<br><br>Single weighted usage parameter is the sum of products of usage rates and % of total technology days for UCS of each age group:<br>= (% of technology days age 0-1 * 67%) + (% of technology days age 1-2 * |

| | |
|---|---|
| | 37%) + (% of technology days age 2-3 * 13%) |
| **QA/QC procedures** | |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | The UCS is relatively expensive stove to disseminate and its adoption has not met expectations to date. GS 613 will discontinue the UCS in MR4. |

| | |
|---|---|
| **Data/Parameter** | **$UP_{,ICS}$** |
| **Unit** | Percent |
| **Description** | Single Weighted Usage Parameter for ICS ages 0-3<br>Based on cumulative usage rate for technologies in project scenario ICS. Usage of stoves over time to determine project fuel consumption for ICS users. |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | Usage and monitoring surveys November 2012 and January - February 2013 |
| **Value(s) of monitored parameter** | 100.00% |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording frequency** | Annual or more frequently, in all cases on time for any request for issuance. One Usage Survey per monitored institution. |
| **Calculation method (if applicable)** | Percentage of stoves in use<br>$U_{P,\ ICS,\ 0\text{-}1}$ = 100% (after 6 months)<br>$U_{P,\ ICS,\ 1\text{-}2}$ = 100% (after 18 months)<br>$U_{P,\ ICS,\ 2\text{-}3}$ = 100% (after 30 months)<br><br>Single weighted usage parameter is the sum of products of usage rates and % of total technology days for ICS of each age group:<br>= (% of technology days age 0-1 * 100%) + (% of technology days age 1-2 * 100%) + (% of technology days age 2-3 * 100%) |
| **QA/QC procedures** | |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | |

| | |
|---|---|
| **Data/Parameter** | **$U_{P, RB}$** |
| **Unit** | Percent |
| **Description** | Single Weighted Usage Parameter for RB ages 0-4<br>Based on cumulative usage rate for technologies in project scenario RB.<br>Usage of barns over time to determine project fuel consumption for RB users. |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | Usage survey for RB in April and May 2012. |
| **Value(s) of monitored parameter** | 82.62% |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording frequency** | Annual or more frequently, in all cases on time for any request for issuance.<br>One Usage Survey per monitored farm. |
| **Calculation method (if applicable)** | Percentage of barns in use.<br>$U_{P, RB, 0-1}$ = 94% (after 1 season)<br>$U_{P, RB, 1-2}$ = 97% (after 2 seasons)<br>$U_{P, RB, 2-3}$ = 81% (after 3 seasons)<br>$U_{P, RB, 3-4}$ = 69% (after 4 seasons)<br><br>Single weighted usage parameter is the sum of products of usage rates and % of total technologies for RB of each age group:<br>= (% of technologies age 0-1 * 94%) + (% of technologies age 1-2 * 97%) + (% of technologies age 2-3 * 81%) + (% of technologies age 3-4 * 69%) |
| **QA/QC procedures** | Pre-testing conducted to train enumerators; sufficiently large sample (n=127) used to minimise bias. |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | |

| | |
|---|---|
| **Data/Parameter** | **$N_{PCS, y}$** |
| **Unit** | Technology days |
| **Description** | Technology days in the project database for the project scenario PCS through year. Used to calculate VERs. |
| **Measured/Calculated/** | Calculated |

| | |
|---|---|
| **Default** | |
| **Source of data** | Total sales record. Calculated from day after technology is disseminated for specific monitoring periods (all dates inclusive). |
| **Value(s) of monitored parameter** | $N_{PCS,\ 02/10/2011 - 01/10/2012}$ = 5,296,549 technology days |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording frequency** | Continuous |
| **Calculation method (if applicable)** | Technology days = number of devices * number of days in use for current monitoring period |
| **QA/QC procedures** | Transparent data analysis and recording |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | |

| | |
|---|---|
| **Data/Parameter** | $\mathbf{N_{FES,\ y}}$ |
| **Unit** | Technology days |
| **Description** | Technology days in the project database for the project scenario FES through year. Used to calculate VERs. |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | Total sales record. Calculated from day after technology is disseminated for specific monitoring periods (all dates inclusive). |
| **Value(s) of monitored parameter** | $N_{FES,\ 02/10/2011 - 01/10/2012}$ = 314,630 technology days |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording frequency** | Continuous |
| **Calculation method (if applicable)** | Technology days = number of devices * number of days in use for current monitoring period |
| **QA/QC procedures** | Transparent data analysis and recording |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | |

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|---|---|
| **Data/Parameter** | **$N_{UCS, y}$** |
| **Unit** | Technology days |
| **Description** | Technology days in the project database for the project scenario UCS through year. Used to calculate VERs. |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | Total sales record. Calculated from day after technology is disseminated for specific monitoring periods (all dates inclusive). |
| **Value(s) of monitored parameter** | $N_{UCS, 02/10/2011 – 01/10/2012}$ = 93,075 technology days |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording frequency** | Continuous |
| **Calculation method (if applicable)** | Technology days = number of devices * number of days in use for current monitoring period |
| **QA/QC procedures** | Transparent data analysis and recording |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | |

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|---|---|
| **Data/Parameter** | **$N_{RB, y}$** |
| **Unit** | Technology seasons |
| **Description** | Technology seasons in the project database for the project scenario RB through year. Used to calculate VERs. |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | Total sales record. Calculated for each full season of RB for specific monitoring periods. |
| **Value(s) of monitored parameter** | $N_{RB, 02/10/2011 – 01/10/2012}$ = 952 technology seasons |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording frequency** | Continuous |

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|---|---|
| **Calculation method (if applicable)** | Technology days = number of devices * number of days in use for current monitoring period |
| **QA/QC procedures** | Transparent data analysis and recording |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | |

| | |
|---|---|
| **Data/Parameter** | $N_{ICS, y}$ |
| **Unit** | Technology days |
| **Description** | Technology days in the project database for the project scenario ICS through year. Used to calculate VERs. |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | Total sales record. Meals are estimated in adult adjusted meals. Number of adult adjusted meals per feeding day and number of feeding days per year estimated to give number of adult adjusted meals per year and divided by 365 gives equivalent amount of ICS meals per day. Then number of ICS days calculated from day of commission for specific monitoring periods. |
| **Value(s) of monitored parameter** | $N_{ICS, 02/10/2011 – 01/10/2012}$ = 41,380 technology days |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording frequency** | Continuous |
| **Calculation method (if applicable)** | Technology days = number of devices * number of days in use for current monitoring period |
| **QA/QC procedures** | Transparent data analysis and recording |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | |

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|---|---|
| **Data/Parameter** | $Eff_{P,PCS}$ |
| **Unit** | % |
| **Description** | Efficiency of aging project PCSs. To assess how the efficiency of project PCS compare to that of a baseline conservative estimation of 31% efficiency for PCS. As project domestic stove demonstrates efficiency <31%, this is to |

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|---|---|
| | factored into suppressed demand calculations. |
| **Measured/Calculated/ Default** | Measured |
| **Source of data** | Water boiling tests in May 2012 and January – March 2013 using Water Boiling Test protocol 4.1.2 (http://www.pciaonline.org/files/WBT4.1.2_0_0.pdf) Test results statistically analysed to establish efficiency of aged PCS for GS 613. |
| **Value(s) of monitored parameter** | $Eff_{P,PCS,0-1}$ = 26% $Eff_{P,PCS,1-2}$ = 25% $Eff_{P,PCS,2-3}$ = 24% $Eff_{P,PCS,3-4}$ = 23% |
| **Monitoring equipment** | Volctraft K-101 Digital Thermometer (Measurement Range -200 C to +200 C; Accuracy ± (0.3% of the display, + 1 C); KD-8000 Scale (Accuracy ± 1g); and Voltcraft FM-300 Wood Humidity Measuring Device. |
| **Measuring/Reading/ Recording frequency** | Every 2 years |
| **Calculation method (if applicable)** | |
| **QA/QC procedures** | Training and pre-testing of protocol. Use of accurate equipment that was recently calibrated in factory. |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | This parameter is included for *suppressed demand* calculations as per GS613 PDD Version 6 Annex 5. The efficiency for each age is used in calculation of ER calculations expressed in "tonnes CO2 / HH / day" columns in the "ER Calcs" Excel database for each technology being credited. Calculations are as follows: ER / hh / day = $(U_{P,PCS,Y} * (P_{b,y} * (1 – (Eff_{b,y} / Eff_{P,PCS,Y}))) / 365$ |

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|---|---|
| **Data/Parameter** | $Eff_{P,FES}$ |
| **Unit** | Percentage |
| **Description** | Efficiency of aging project FESs. To assess how the efficiency of project FES compare to that of a baseline conservative estimation of 31% efficiency for PCS. As project domestic stove demonstrates efficiency <31% this is factored into suppressed demand calculations. |
| **Measured/Calculated/ Default** | Measured |
| **Source of data** | Water boiling tests in May 2012 using Water Boiling Test protocol 4.1.2 (http://www.pciaonline.org/files/WBT4.1.2_0_0.pdf) |

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| | No further WBTs conducted on FES as the technology being removed from GS 613 subsequent to MR3 and only 50% of emission reductions generated in monitoring period 3 are being claimed for in MR 3. |
| **Value(s) of monitored parameter** | $Eff_{P,FES,0-1}$ = 25%<br>$Eff_{P,FES,1-2}$ = 17%<br>$Eff_{P,FES,2-3}$ = 17% |
| **Monitoring equipment** | Volctraft K-101 Digital Thermometers (Measurement Range -200 C to +200 C; Accuracy ± (0.3% of the display, + 1 C); KD-8000 Scale (Accuracy ± 1g); and Voltcraft FM-300 Wood Humidity Measuring Device. |
| **Measuring/Reading/ Recording frequency** | Every 2 years |
| **Calculation method (if applicable)** | |
| **QA/QC procedures** | Training and pre-testing of protocol. Use of accurate equipment that was recently calibrated in factory. |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | This parameter is included for *suppressed demand* calculations as per GS613 PDD Version 6 Annex 5. The efficiency for each age is used in calculation of ER calculations expressed in "tonnes CO2 / HH / day" columns in the "ER Calcs" Excel database for each technology being credited. Calculations are as follows:<br>$ER / hh / day = (U_{P,FES,Y} * (P_{b,y} * (1 – (Eff_{b,y} / Eff_{P,FES,Y}))) / 365$ |

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|---|---|
| **Data/Parameter** | $Eff_{P,UCS}$ |
| **Unit** | Percent |
| **Description** | Efficiency of aging project FESs. To assess how the efficiency of project UCS compare to that of a baseline conservative estimation of 31% efficiency for PCS. As project domestic stove demonstrates efficiency <18.1%, this is factored into suppressed demand calculations. |
| **Measured/Calculated/ Default** | Measured |
| **Source of data** | Water boiling tests in May 2012 using Water Boiling Test protocol 4.1.2 (http://www.pciaonline.org/files/WBT4.1.2_0_0.pdf) |
| **Value(s) of monitored parameter** | $Eff_{P,UCS,0-1}$ = 23%<br>$Eff_{P,UCS,1-2}$ = 22%<br>$Eff_{P,UCS,2-3}$ = 22% |
| **Monitoring equipment** | Volctraft K-101 Digital Thermometers (Measurement Range -200 C to +200 C; Accuracy ± (0.3% of the display, + 1 C); KD-8000 Scale (Accuracy ± |

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| | 1g); and Voltcraft FM-300 Wood Humidity Measuring Device. |
| **Measuring/Reading/ Recording frequency** | Every 2 years |
| **Calculation method (if applicable)** | |
| **QA/QC procedures** | Training and pre-testing of protocol. Use of accurate equipment that was recently calibrated in factory. |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | This parameter is included for *suppressed demand* calculations as per GS613 PDD Version 6 Annex 5. The efficiency for each age is used in calculation of ER calculations expressed in "tonnes CO2 / HH / day" columns in the "ER Calcs" Excel database for each technology being credited. Calculations are as follows:<br>ER / hh / day = $(U_{P,UCS,Y} * (P_{b,y} * (1 – (Eff_{b,y} / Eff_{P,UCS,Y}))) / 365$<br><br>Though WBTs for UCS age 1-2 years yielded higher efficiency than 22%, this value was used to be conservative. |

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|---|---|
| **Data/Parameter** | Bpj,y |
| **Unit** | Tonnes of dry biomass |
| **Description** | Monitored consumption of fuels over time. Tonnes of dry biomass used in the project for technology and fuel combination pj in year y |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | (i) Baseline Field Test (BFT) for PCS, and<br>(ii) Project Field Test for PCS users 2 years after purchasing PCS<br>Monitoring equipment: Voltcraft FM-300 Wood Humidity Measuring Device; Voltcraft digital hanging scales to weigh biomass; Biomass consumption and moisture content are monitored and measured using protocols prescribed in the methodology |
| **Value(s) of monitored parameter** | 1.6895 Tonnes of dry biomass = ((1.566 + 1.813 tonnes biomass)/2) |
| **Monitoring equipment** | Voltcraft FM-300 Wood Humidity Measuring Device; Voltcraft digital hanging scales to weigh biomass; |
| **Measuring/Reading/ Recording frequency** | Fixed updated baseline; $B_{PY}$ or $P_{PY}$ (project update) revised every 2 years. |
| **Calculation method (if applicable** | |

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| **QA/QC procedures** | Trained enumerators, sufficiently large sample. |
| **Purpose of data** | Calculations for suppressed demand |
| **Additional comment** | This parameter is included for *suppressed demand* calculations.<br>Baseline wood use = Bpj,y * (Eff $_{p,y}$ / Eff $_{b,y}$)<br>Baseline emissions ($Eff_{b,y}$) = Baseline wood use * Emission factor of baseline and project fuel<br>$Eff_{b,y}$ ultimately used in ER calculations as follows :<br>ER / hh / day = ($U_{P,Y}$ * ($P_{b,y}$ * (1 – ($Eff_{b,y}$ / $Eff_{P,Y}$))) / 365<br>To be updated for MR4. |

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|---|---|
| **Data/Parameter** | $LE_{p,MR2}$ |
| **Unit** | tCO2e per year |
| **Description** | Leakage in project scenario during year 2/10/2011 – 1/10/2012 |
| **Measured/Calculated/ Default** | Calculated |
| **Source of data** | Baseline and monitoring surveys |
| **Value(s) of monitored parameter** | 0 tCO2e per year |
| **Monitoring equipment** | |
| **Measuring/Reading/ Recording frequency** | Every 2 years |
| **Calculation method (if applicable)** | |
| **QA/QC procedures** | Transparent data analysis and reporting |
| **Purpose of data** | Calculation of emission reductions |
| **Additional comment** | Leakage assessed is reported every 2 years. First leakage assessment was reported in MR1 and a value of zero was assigned for MR2. A value of zero is again assigned for MR3.<br><br>Aggregate leakage is assessed for multiple project scenarios through ongoing monitoring surveys for each of the project technologies, dates of which are reported above. To date no sources of leakage have been identified, e.g. no households claim to use the stoves for any purpose other than cooking and heating water (no space heating). Please see Part IV.4 for further discussion on leakage. |

**Monitoring Results for Gold Standard Sustainability Indicators as per GS613 Passport Version 4 (Gold Standard Requirement)**

| Indicator | Data type | Data variable | Data unit | Value | Source |
|---|---|---|---|---|---|
| Air quality | Survey and/or PM concentrations | Air pollutants (CO, particulates) | Survey observations and /or indoor air pollution | Qualitative: 100% of survey respondents stated that there is less smoke from devices promoted by the project In the Kitchen Survey for FES and PCS conducted in May, June and December 2012.<br><br>Quantitative: Air quality tests carried out in 2009 reveal an average reduction of 41% in PM concentrations for PCS users and 55% in PM concentrations for FES users. | FES KS results excel, PCS KS results excel. |
| Water quality and quantity | Survey | Soil erosion / river siltation -mitigated due to reduction in tree-felling. | Proper use of devices<br><br>Sales data | All end-users are using improved devices properly and are generating wood fuel savings.<br><br>Shire river produces most of Malawi's hydro electricity and has been identified by Malawi's National Adaptation Programme of Action (NAPA) as a region where reforestation should be prioritised. Approximately 8,848 households that have accessed PCS are located in the Upper Shire region in keeping with priorities of NAPA.<br><br>It is assumed that wood savings translate into reduced tree felling or a reduction in the increase of tree felling, asscociated with current trends in deforestation and increased rpessure on natural resources. | FES KS results excel, PCS KS results excel, RB BS results excel. |
| Soil condition | Survey | Soil quality at a community level - Soil condition enhanced due to reduced soil erosion. | Clay collection for use as an input into stove production. | Sources of clay for all PCS production centers monitored.<br><br>Reduced wood harvests and associated reduction in deforestation, which is the borm, are likely not to deteriorate soil quality. | Clay monitoring excel. |
| Biodiversity | Surveys | Alteration and destruction of natural habitat mitigation | Proper use of stoves | Reduced pressure on natural resources can improve the integrity of natural habitat for flora and fauna.<br><br>15,449 households using improved Cook Stoves, 21 institutions using improved Institutional cook stoves and 952 Rocket Barns being used contribute positively to reducing pressure on natural resources. | FES KS results excel, PCS KS results excel, RB BS results excel ICS KS in excel. |
| Quality of employmen t | Policies | Provision of health insurance for Project Staff | Project staff with health insurance. | All staff employed directly by the project are covered with health insurance | Area 55 General Policies and Procedures |
| Livelihood of the poor | Survey | Financial impact (Note: savings estimated are | MK (Malawi Kwacha) saved per year | From the devices disseminated by the project to date: | Livelihood of poor excel, FES KS results excel, |

| | | | | | |
|---|---|---|---|---|---|
| | | only economic estimation of wood savings and not real monetary saving for households since the wood is mostly collected and not purchased). | | Savings of wood is valued at MK 152.1 million p.a.<br><br>Savings of labour in terms of both cooking / curing time savings and fuel collection savings is valued at MK 159.8 million p.a.<br><br>Improved income from RB is valued at MK 66 million p.a., which is likely to have a multiplier effect in rural areas where RBs are located. | PCS KS results excel, RB BS results excel. |
| Access to affordable and clean energy services | Survey | Access to clean technologies | Number of stoves and rocket barns sold. | Up to 15,449 households (approx 14,623 + 826) have accessed affordable and appropriate PCS and FES.<br><br>21 institutions are using 31 improved institutional stoves.<br><br>952 Rocket Barns being used in Malawi smallholder flue-cure sector. | Sales Records (from November 24 2008 to October 1 2011) and FES KS results excel, PCS KS results excel, RB BS results excel ICS KS in excel. |
| Human and Institutional capacity | Survey | Numbers | Trainees, employees with new skills | 616 (82% female) trained on ceramic stove production; 403 (59% female) trained on marketing, awareness raising and stove promotion; 32 trades people trained on RB, ICS and UCS construction techniques; and 22 people work at a coordination level trained on various skills such as business, database management, geographic information systems, surveys and Kitchen / Barn performance tests. | Employment and skills development excel. |
| Quantitative employment and income generation | Survey | Numbers – job creation | Jobs / year | The project is generating income for 1,078 people (99% in rural areas, 70% women). | Employment and skills development excel. |
| Balance of payments & investment | Clay monitoring info and example invoices from new companies | Increased investment in dissemination of improved devices | New businesses.<br><br>New production groups. | Project provided seed capital to 2 former employees to set up as sub-contractors. | Evidence of Charles Construction and Phukaphuka.<br><br>New groups documented in clay monitoring excel. |
| Technology transfer & technological self reliance | Total sales records | Dissemination record | Number of stoves and rocket barns sold. | As in access to clean technologies above. | Sales Records (from November 24 2008 to October 1 2012) and FES KS results |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | excel, PCS KS results excel, RB BS results excel ICS KS in excel. |

**D.3. Implementation of sampling plan**

Usage and monitoring surveys for UCS, FES and RB applied a simple random sample from their respective total sales records for devices of different ages. For the ICS, as there are only 22 institutions using the technology, effort was made to contact each institution for usage and monitoring. For the PCS, over 90% of the stoves sold are in a concentrated area within 3 – 4 TAs (Traditional Authorities) that consist of more than 800 villages in 3 of the 30 districts of Malawi. Based on discussions with field officers and as allowed by the Methodology[4], five geographic jurisdictions locally called Group Village Headman (GVH) each containing on average 10 villages, were selected as being representative of 800-plus villages and users of technologies of each age were random sampled from this cluster. This approach can be justified as the villages share very similar socioeconomic, cultural, climatic, geographic and altitudinal characteristics. This approach also facilitated efficient and effective monitoring in terms of time, effort and financial costs.

For the usage survey for RBs, as there is only one season per year, the actual results are used for usage rates. For FES and PCS domestic stoves demand is seasonal and dissemination is not evenly distributed throughout the year, which complicated calculating usage at time intervals of 6 months, 18 months and 30 months. For this reason assistance was sought from qualified statisticians to conduct a regression analysis to calculate usage at the various time intervals to ensure conservativeness in all calculations of fuel savings and emission reductions.

In all cases the minimum sample sizes have been met and in some cases there has been over-sampling.

Water boiling tests have been conducted for aging stoves. For PCS, stoves of various ages were randomly selected from one village and the users were asked to give up their old stoves in return for a new stove. Water boiling tests will be continually conducted using a similar approach for aging stoves. For FES tests will continue to be conducted in situ.

In terms of the desired precision for wood savings estimations, the "90 : 30" rule has been satisfied for all technologies.

A new implementation schedule has been drawn up and presented in the revised monitoring plan, which plans for GS 613 to conform with *"Technologies and Practices to Displace Decentralised Thermal Energy Consumption (11/04/2011)."*

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

Emission reduction calculation follows Gold Standard methodology *Technologies and Practices to Displace Decentralised Thermal Energy Consumption (11/04/2011)*; calculation steps are detailed in GS613 PDD V6 (Date November 2, 2012).

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

For all five (5) technologies promoted by GS 613 the baseline fuel (i.e. woody biomass) and the project fuel (i.e. woody biomass) are the same, the baseline and project emission factors are the same.
$EF_{b,\ wood,\ CO2}$ = $EF_{p,\ wood,\ CO2}$ = 1.7472 tCO2/t wood

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$EF_{b, wood, nonCO2}$ = $EF_{p, wood, nonCO2}$ = 0.4554 tCO2/t wood
$fNRB_{i,p}$ = $fNRB_{i,b}$ = 0.81

In the baseline and project scenarios the combined CO2 and non-CO2 emission factor for wood is:
= ((1.7472 * 0.81) + 0.4554) tCO2/t wood
= **1.871 tCO2/t wood**

GS 613 promotes three household cookstoves (i.e. PCS, FES and UCS). PCS is the Project's stove with the highest sales to date and its Project dissemination began before the project's other domestic stoves (i.e. FES and UCS) so more historic information is available for PCS.

| | Before considering SD | | | | Adjusted Baseline considering Suppressed Demand | | | | |
|---|---|---|---|---|---|---|---|---|---|
| HH stove | Tons_wood / HH p.a. | | | Savings | Fuel efficiency | | Tons_wood / HH p.a. | | |
| | $P_{b,0}$ | $P_{p,0}$ | $P_{b,0}$-$P_{p,0}$ | % | Default value $Eff_{b,y}$ | CREEC, 2012 $Eff_{p,y,0}$ | B pj, $_{2011}$ | B pj, $_{2009}$ | $P_{b,0,SD}$ |
| PCS | **2.561** | 1.566 | **0.995** | **39%** | 10% | 31% | 1.813 | **1.6895** | 5.237 |
| FES | 3.361 | 1.747 | 1.614 | 48% | | | | | |
| UCS | 2.888 | 1.174 | 1.714 | 59% | | | | | |

**Table 2: Comparison of domestic stoves in tons_wood / HH p.a.**

Table 2 above clearly shows that of the three domestic stoves promoted by GS 613, PCS has the lowest baseline consumption, the lowest absolute project savings and the lowest percentage project savings.

To simplify monitoring and improve GS613's effectiveness, the PP proposes that FES and UCS conservatively adopt the same values as PCS for (i) project consumption for PCS (i.e. lower than baseline consumption for both FES and UCS) and (ii) suppressed demand adjusted baseline consumption of 5.237 Tons_wood / HH p.a. which is equivalent to baseline domestic stove emissions of **9.797 tCO2eq / HH p.a.**

Baselines emissions for RBs are the product of 15.73 tons_wood / year by the combined emission factor of 1.871 emissions / ton_wood = **29.42 tCO2eq / RB p.a.**

For institutional cook stoves, baseline and project emissions are based on adjusted adult meals, where children's meals and light meals (e.g. teas) are normalised to be on the same metric as adult meals. Baseline consumption of one adult meal was 374gs of wood / adjusted adult meal, which is equivalent to **6.742 tCO2eq / 10,000 adjusted adult meals p.a.**

$BE_{b,y} = B_{b,y} * (f_{NRB,y} * EF_{b,fuel,CO2}) + EF_{b,fuel,nonCO2}) * NCV_{b,fuel}$

**Baseline** Emissions (tCO2e)
Carbon flows

| | | | Monitoring period | | | | |
|---|---|---|---|---|---|---|---|
| | | | MR1 | MR2 | MR3 | | |
| Offset vintage | Device | Devices sold | 24/11/2008 - 1/10/2009 | 2/10/2010 - 1/10/2011 | 2/10/2011 - 1/10/2012 | Total | |
| 24/11/08 - 1/10/09 | PCS | 1,767 | 5,431 | 10,636 | 10,033 | 26,100 | 39,059 |
| | FES | 0 | 0 | 0 | | 0 | |
| | UCS | 0 | 0 | 0 | | 0 | |
| | ICS | 0 | 0 | 0 | | 0 | |
| | RB | 153 | 4,197 | 4,339 | 4,424 | 12,960 | |
| 02/10/09 - 1/10/10 | PCS | 5,308 | 5,193 | 34,421 | 31,104 | 70,719 | 136,762 |
| | FES | 1,524 | 3,633 | 6,380 | 0 | 10,013 | |
| | UCS | 51 | 0 | 310 | 0 | 310 | |
| | ICS | 1 | 0 | 7 | 9 | 15 | |
| | RB | 588 | 20,323 | 18,374 | 17,008 | 55,704 | |
| 2/10/10 - 1/10/11 | PCS | 5,839 | 0 | 24,907 | 35,194 | 60,101 | 78,006 |
| | FES | 862 | 0 | 3,126 | 1,797 | 4,923 | |
| | UCS | 204 | 0 | 578 | 0 | 578 | |
| | ICS | 30 | 0 | 198 | 756 | 954 | |
| | RB | 211 | 0 | 5,835 | 5,616 | 11,451 | |
| 2/10/11- 1/10/12 | PCS | 1,709 | 0 | 0 | 9,873 | 9,873 | 9,873 |
| | FES | 0 | 0 | 0 | 0 | 0 | |
| | UCS | 0 | 0 | 0 | 0 | 0 | |
| | ICS | 0 | 0 | 0 | 0 | 0 | |
| | RB | 0 | 0 | 0 | 0 | 0 | |
| | | | | | 115,812 | | 263,700 |

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

Project emissions are calculated for PCS, UCS and FES as per Annex 5 of the GS 613 PDD V 6:

Project Fuel Consumption * Emission Factor of Project Fuel
= 1.690 tonnes_wood / hh / year * 1.871 = 3.160

For ICS, project emissions are calculated per 10,000 meals / year in a similar way:

Project Fuel Consumption (per 10,000 meals / year) * Emission Factor of Project Fuel
= 0.854 tonnes_wood / 10,000 meals / year * 1.871 = 1.598

For RB, project emissions = Average output per barn * Project efficiency * Emission factor of project fuel
= 1.315 tonnes_output / year * 4.26 kg_wood / kg_output * 1.871= 10.479

**Project** Emissions (tCO2e)
Carbon flows

| | | | Monitoring period | | | | |
|---|---|---|---|---|---|---|---|
| | | | MR1 | MR2 | MR3 | | |
| Offset vintage | Device | Devices sold | 24/11/08 - 1/10/09 | 2/10/10 - 1/10/11 | 2/10/11 - 1/10/12 | Total | |
| 24/11/08 - 1/10/09 | PCS | 1,767 | 1,752 | 3,431 | 3,236 | 8,419 | 13,035 |
| | FES | 0 | 0 | 0 | 0 | 0 | |
| | UCS | 0 | 0 | 0 | 0 | 0 | |
| | ICS | 0 | 0 | 0 | 0 | 0 | |
| | RB | 153 | 1,495 | 1,545 | 1,576 | 4,616 | |
| 02/10/09 - 1/10/10 | PCS | 5,308 | 1,675 | 11,104 | 10,034 | 22,813 | 45,987 |
| | FES | 1,524 | 1,172 | 2,058 | 0 | 3,230 | |
| | UCS | 51 | 0 | 100 | 0 | 100 | |
| | ICS | 1 | 0 | 2 | 2 | 4 | |
| | RB | 588 | 7,239 | 6,545 | 6,058 | 19,841 | |
| 2/10/10 - 1/10/11 | PCS | 5,839 | 0 | 8,035 | 11,353 | 19,387 | 25,467 |
| | FES | 862 | 0 | 1,008 | 580 | 1,588 | |
| | UCS | 204 | 0 | 186 | 0 | 186 | |
| | ICS | 30 | 0 | 47 | 179 | 226 | |
| | RB | 211 | 0 | 2,078 | 2,000 | 4,079 | |
| 2/10/11 - 1/10/12 | PCS | 1,709 | 0 | 0 | 3,185 | 3,185 | 3,185 |
| | FES | 0 | 0 | 0 | 0 | 0 | |
| | UCS | 0 | 0 | 0 | 0 | 0 | |
| | ICS | 0 | 0 | 0 | 0 | 0 | |
| | RB | 0 | 0 | 0 | 0 | 0 | |
| | | | | | 38,202 | | 87,674 |

The ERs achieved during the monitoring period are the sum of calculations for each technology (less leakage) using the formula below:

$VERs = N_{PCS\ 2/10/2011 - 1/10/2012} * ER / hh / day$

Where

$ER / hh / day = (U_{PCS\ 0\text{-}4} * (P_{b,y} * (1 - (Eff_{b,y} / Eff_{P,PCS,Y}))) / 365$

And

$U_{PCS\ 0\text{-}4}$ represents the single weighted usage for the technology ages 0-4
$P_{b,y}$ represents the baseline emissions
$Eff_{b,y}$ represents the efficiency of the baseline technology
$Eff_{P,PCS,Y}$ represents the efficiency of the project technology

To illustrate, on November 23, 2011, 20 PCS were sold. By the end of the monitoring period, these technologies had each been in use for 313 days, so $N_{PCS\ 2/10/2011 - 1/10/2012} = 20 * 313 = 6,260$.

As these technologies were in their first year of use,
ER / hh / day = (69.46% * (9.796 * (1 – 10/31))) / 365 = 0.01147

Therefore, VERs generated by PCS sold on November 23, 2011 = 6,260 * 0.01147 = 71.82

Conservative Project **Emissions Reductions** (tCO2e)
Carbon flows

| | | | Monitoring period | | | | |
|---|---|---|---|---|---|---|---|
| | | | MR1 | MR2 | MR3 | | |
| Offset vintage | Device | Devices sold | 24/11/08 - 1/10/10 | 2/10/2010 - 1/10/2011 | 2/10/2011 - 1/10/2012 | Total | |
| 24/11/08 - 1/10/09 | PCS | 1,767 | 3,679 | 7,205 | 6,796 | 17,680 | 26,024 |
| | FES | 0 | | | 0 | 0 | |
| | UCS | 0 | 0 | 0 | 0 | 0 | |
| | ICS | 0 | | | 0 | 0 | |
| | RB | 153 | 2,702 | 2,793 | 2,848 | 8,344 | |
| 02/10/09 - 1/10/10 | PCS | 5,308 | 3,518 | 23,318 | 21,071 | 47,906 | 90,774 |
| | FES | 1,524 | 2,461 | 4,322 | 0 | 6,783 | |
| | UCS | 51 | 0 | 210 | 0 | 210 | |
| | ICS | 1 | | 5 | 7 | 12 | |
| | RB | 588 | 13,084 | 11,830 | 10,950 | 35,863 | |
| 2/10/10 - 1/10/11 | PCS | 5,839 | 0 | 16,872 | 23,841 | 40,713 | 52,539 |
| | FES | 862 | | 2,118 | 1,217 | 3,335 | |
| | UCS | 204 | 0 | 391 | 0 | 391 | |
| | ICS | 30 | | 151 | 577 | 728 | |
| | RB | 211 | | 3,757 | 3,616 | 7,372 | |
| 2/10/11- 1/10/12 | PCS | 1,709 | 0 | 0 | 6,688 | 6,688 | 6,688 |
| | FES | 0 | | | 0 | 0 | |
| | UCS | 0 | 0 | 0 | 0 | 0 | |
| | ICS | 0 | | | 0 | 0 | |
| | RB | 0 | | | 0 | 0 | |
| | | | 25,444 | 72,972 | **77,610** | | 176,026 |

## E.3 Calculation of leakage

GS613 was previously monitored for leakage in MR1 where no significant sources of leakage were identified. To date, no major sources of leakage have been identified.

The following possible sources of leakage continue to be monitored in annual Monitoring and Usage Surveys, and Project Field Performance Tests:

- Increased use of non-renewing biomass as a result of savings in woodfuel use. Evidence from the baseline kitchen surveys and tests demonstrate (i) increasing scarcity of wood and (ii) increasing price of woodfuel. Avoided consumption should also be considered in a context where basic energy needs are not being met in baseline scenarios.
- Users of efficient stoves or barns replace lower emissions technology than the improved stove. For example, switching from inefficient fuelwood to efficient charcoal can yield an increase in overall emissions in some cases. There is also evidence from the baseline Kitchen Surveys and Tests for the portable ceramic stove in Balaka that some of the few rural households that were using charcoal during the baseline shifted to use of wood fuel with lower net GHG emissions. GS 613 does not promote the use of charcoal or appliances that use charcoal, and its fuel-efficient wood-burning devices aim to discourage the use of charcoal, which is currently harvested unsustainably and produced inefficiently in Malawi.
- Improved stove users compensate for loss of the space heating effect of inefficient cook-stoves by adopting some other form of heating, such as open fires, or by retaining some use of inefficient stoves. Space heating effect is already duly captured in the KPTs (over a 72-hour period). The baseline was not conducted in cold period or in high altitude areas thus avoiding bias in the pre-project consumption. KPTs were conducted in the same season as the baseline which is appropriate.
- The traditional or conventional stoves and barns replaced by the improved stoves and barns are re-used by the same families or other families in a manner suggesting increased consumption of woodfuel beyond the baseline demand level. GS 613 predominantly replaces 3-stone fires which

are used by over nine out ten rural households in Malawi (Energy Policy 2003). There is no evidence of old barns being used in a manner of increased consumption.

- Manufacture, distribution, or use of the improved stoves gives rise to new emissions associated with transport or manufacturing. An analysis presented in the baseline Barn Survey demonstrates that this effect for rocket barns is more than compensated for by reduction in transport emissions due to decreases in woodfuel use. Similarly, wood that is used in the firing of ceramics (e.g. portable ceramic stove) is negligible (e.g. 2 kg / stove compared to the annual savings (e.g. >1 tonne / stove / year).

Future offset calculations will be adjusted accordingly if sources of leakage are later identified. It should be considered that the basic energy needs are not being met in the baseline scenarios and savings are used to bridge this gap and are unlikely to be wasted or lost through leakages.

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

| Time Period | Baseline emissions or baseline net GHG removals by sinks | Project emissions or actual net GHG removals by sinks | Leakage | Emission reductions or net anthropogenic GHG removals by sinks |
|---|---|---|---|---|
| 02/10/2011-01/10/2012 | **($tCO_2e$)** | **($tCO_{2e}$)** | **($tCO_2e$)** | **($tCO_2e$)** |
| **Total** | 115,812 | 38,202 | | 77,610 |

Note the Project is undergoing a simple scale reduction and is within the Small Scale threshold of 77,646.50 CO2 eq . p.a. (see calculation below):

Using 81% NRB for Malawi the tonnes CO2eq / tonne wood increases to 1.871

15.6GJ/tonne wood * 1000MJ/GJ/3.6MJ/kWh/100,000kWh/GWh
= 0.00043GWh/tonne wood

So 180GWh/year = 41,500 tonnes of wood or,

41,500 tonnes wood/year * 1.871 tonnes CO2/tonne wood

= 77,646.5 tonnes CO2/year

Total VERs to be claimed in MR2 is 77,610 which is equivalent to 41,480 tonnes wood/year below the small scale threshold of 41,500 tonnes of wood.

**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 |
|---|---|---|
| **Emission reductions or GHG removals by sinks ($tCO_2eq$)** | 77,630 VERs for year 4 (24/11/2011 – 23/11/2012) as | 77,610 VERS for year 2/10/2011 to 1/10/2012 (inclusive of both |

| | | |
|---|---|---|
| | per registered PDD Version 6 | dates). |

## E.6. Remarks on difference from estimated value in registered PDD

GS613 has reached the upper limits of small scale methodology quicker as projected in the revised PDD GS613 V6.

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**History of the document**

| Version | Date | Nature of revision |
|---|---|---|
| 02.0 | EB 66<br>13 March 2012 | Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20). |
| 01 | EB 54, Annex 34<br>28 May 2010 | Initial adoption. |
| **Decision Class**: Regulatory<br>**Document Type**: Form<br>**Business Function**: Issuance | | |

**Annex 1. Sampling and Monitoring Schedule for GS613 (to be updated annually):**

| **Parameters** | **GS 613 V.6** | **Last done** | **Next Due?** |
|---|---|---|---|
| NRB | Fixed; updated if necessary | Proposed default of 81% accepted by Malawi's DNA on 15 June 2012 | Updated if necessary (no update period specified) |
| Fuel consumption in baseline (PBY) or BBL,Y** to verify; baseline FT update | Updated every 2 years, except in cases where a fixed baseline is adopted | Fixed baseline is adopted and accepted | Fixed baseline is adopted and accepted |
| BP,Y or PPY, project FT update | Every 2 years for RB and ICS; PCS not monitored as per SD approach | 2011 (RB, PCS, UCS, ICS) 2012 (FES) | 2013 (RB, ICS) |
| Usage (drop off rate) UPY (project scenario) | Annual or more frequently | 2012 (PCS, RB, FES, ICS, UCS) | 2013 (PCS, RB, ICS) |
| Performance test/project fuel test (WBTs for domestic wood stoves) | Every 2 years | 2011 (RB, ICS) 2012 (PCS, UCS, FES) | 2013 (RB, ICS) 2014 (PCS) |
| New stove performance | No new stove | | |
| Stove sales | Continuous | Continuous | Continuous |
| Monitoring surveys | Every year | 2012 (RB, PCS, UCS, ICS, FES) | 2013 (RB, PCS, ICS) |
| *GSF required SD indicators* | | | |
| Air Quality | Annual | 2012, 2013 monitoring surveys (PCS, UCS, FES, ICS, | In time for MR 4 |
| Water qual & quan | Annual | In time for MR 3 | In time for MR 4 |
| Soil condition | Annual | 2012 | In time for MR 4 |
| Biodiversity | Annual | In time for MR 3 | In time for MR 4 |
| Quality of employment | Annual | 2012 | In time for MR 4 |
| Livelihood of the poor | Annual | 2012 | In time for MR 4 |
| Access to clean energy | Annual | 2012 | In time for MR 4 |
| Human & instit. Cap | Annual | 2012 | In time for MR 4 |
| Quant employm't & IGAs | Annual | 2012 | In time for MR 4 |
| BoP & investments | Annual | 2012 | In time for MR 4 |
| Tech transfer | Annual | 2012 | In time for MR 4 |
| *Leakage assessment* | | 2012, 2013 (PCS, ICS, UCS, FES, RB) | |
| Update parameters | Every 2 years | 2013 for MR3V5 | MR 5 |