



**Monitoring report form for CDM programme of activities  
(version 01.0)**

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form for CDM programme of activities" at the end of this form.

**MONITORING REPORT**

<b>Title of the programme of activities (PoA)</b>	PoA Title: African Improved Cooking Stoves Programme of Activities	
<b>UNFCCC reference number of the PoA</b>	PoA reference number: 5342	
<b>Version number(s) of the PoA-DD(s) applicable to this monitoring report</b>	4.3	
<b>Coordinating/managing entity (CME)</b>	Envirofit International Ltd.	
<b>Version number of this monitoring report</b>	1.1	
<b>Completion date of this monitoring report</b>	22/04/2016	
<b>Monitoring period number and dates covered by this monitoring report</b>	Monitoring period: 02 15/12/2013 - 24/10/2014	
<b>Monitoring report number for this monitoring period</b>	1	
<b>Host Party(ies)</b>	<b>Host Party(ies) of the PoA</b>	<b>Is this a host Party to a specific-case CPA covered in this monitoring report?(yes/no)</b>
	Ghana	Yes
	Nigeria	No
	Liberia	No
<b>Sectoral scope(s)</b>	Sectoral scope: 3: Energy demand	
<b>Selected methodology(ies)</b>	AMS-II.G ver 3.0: Energy efficiency measures in thermal applications of non-renewable biomass	
<b>Selected standardized baseline(s)</b>	Not Applicable	
<b>Total amount of GHG emission reductions or net GHG removals by sinks for all specific-case CPAs in the PoA covered in this monitoring report</b>	<b>GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012</b>	<b>GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards</b>
	0	20,342

## PART I - Programme of activities

### SECTION A. Description of PoA

#### A.1. Brief description of the PoA

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The purpose of this Programme of Activities (PoA) is the dissemination of improved biomass cooking stoves (ICS) in Ghana, Nigeria and Liberia. The Programme will promote stove categories that replace existing less efficient cooking stoves using woody-biomass (wood-fuel and/or charcoal).

The ICS distributed under the programme are more efficient in transferring heat from the fuel to the pot when compared to the stoves typically being used in the baseline. By replacing inefficient baseline stoves, the PoA saves on consumption of woody biomass (either wood or charcoal made from wood) which is the dominant fuel used for cooking in project households. The ICSs applied in this PoA have been designed to match the traditional utensils and cooking habits of the target consumers in host countries.

In accordance with version 3.0 of the small-scale CDM methodology AMS-II.G, in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs. Therefore, by reducing the amount of fuel required for cooking and thus the use of non-renewable woody biomass, the replacement of less efficient stoves with more efficient ICS reduces the amount of greenhouse gases (GHG) emitted into the atmosphere.

Envirofit International Ltd (Envirofit) is the coordinating/managing entity (CME) for this PoA and coordinates the efforts of different Distribution Organizations (DOs) who are involved in distribution of ICS within the boundary of the PoA and comply with the requirements of this PoA. Each DO sells ICSs either directly or through retailers, entrepreneurs or other agents sub-contracted by the DO. The CME provides training and guidance on the correct distribution and monitoring procedures to each DO. Each DO acts individually, implementing the CPA(s) in accordance with local circumstances and the requirements prescribed by CME.

#### A.1.1. Generic CPA(s)

Title, identification/reference number and/or version number of the generic CPA(s) of the PoA	Sectoral scope(s)	Applied methodology(ies) or combination of methodologies and/or standardized baseline(s)
<p><b>Title:</b> African Improved Cooking Stoves Programme of Activities – Generic CPA  <b>Identification:</b> Part II of revised PoA-DD version 4.3 dated 07/06/2014  <b>Reference:</b> <a href="http://cdm.unfccc.int/UserManagement/FileStorage/V96Q8RJG3DUWTMXIYH20Z4LPE5B7OF">http://cdm.unfccc.int/UserManagement/FileStorage/V96Q8RJG3DUWTMXIYH20Z4LPE5B7OF</a>  <b>Version:</b> 1.0</p>	Sectoral Scope 3	AMS-II.G, version 3: Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass

#### A.1.2. Specific-case CPA(s) covered in this monitoring report

Reference number of the specific-case CPA included in the PoA as of	Title, identification/ reference number and version number of the generic CPA to which the specific-case CPA applies	Crediting period dates of the specific-case CPA	Is this specific-case CPA covered in this monitoring
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the end of this monitoring period <sup>1</sup>			report? (yes/no)
5342-0001	<b>Title:</b> African Improved Cooking Stoves Programme of Activities – Generic CPA <b>Identification:</b> Part II of revised PoA-DD version 4.3 dated 07/06/2014 <b>Reference:</b> <a href="http://cdm.unfccc.int/UserManagement/FileStorage/V96Q8RJG3DUWMTXIYH20Z4LPE5B7OF">http://cdm.unfccc.int/UserManagement/FileStorage/V96Q8RJG3DUWMTXIYH20Z4LPE5B7OF</a> <b>Version:</b> 1.0	15 Dec 2012 – 14 Dec 2022	Yes
5342-0002		01 Nov 2013 - 31 Oct 2023	Yes
5342-0003		01 Dec 2013 – 30 Nov 2023	Yes
5342-0004		25 Oct 2014 – 24 Oct 2024	No
5342-0005		25 Oct 2014 – 24 Oct 2024	No

## A.2. Contact information of the coordinating/managing entity (CME) and/or responsible persons(s)/entity(ies)

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Envirofit International Limited is the CME for the PoA. The responsible persons for completing the CDM-PoA-MR-Form are as follows:

Nick Marshall  
 Managing Director – Carbon Programmes  
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## SECTION B. Implementation of PoA

### B.1. Implementation of the management system of the PoA

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Envirofit International Limited is the Coordinating and Managing Entity (CME) for the PoA. The Distributing Organization(DO) for the CPAs included in the PoA are as follows:

CPA	Name of DO	Status of CPA Implementation
CPA00001	The Centre of Energy, Environment and Sustainable Energy (CEESD)	Implemented
CPA00002	--	Not implemented
CPA00003	The Centre of Energy, Environment and Sustainable Energy (CEESD)	Implemented

CEESD is the DO for the CPAs that have been implemented under the PoA so far and has subcontracted retailers/entrepreneurs (referred as dealers) for dissemination of project stoves. The implemented CPA follow the following management system:

1. Envirofit provided instructions to CEESD to collect the end user information at the time of sales to make the stove eligible under the PoA. Envirofit made CEESD aware of requirements of end user data collection. Guidance was provided to them on the correct procedures to be followed during distribution.
2. Envirofit maintains a PoA Distribution and Monitoring database. This database is a compilation of CPA distribution records. The database includes CPA wise list of stoves sales, based on following information, received from CEESD, (CEESD collected this information at the time of sale, in CPA distribution record form):
  - a. Name of customer
  - b. Address / location of the customer

<sup>1</sup> CPA 5342-0006 has not been included in section A.1.2 as its date of inclusion in the PoA is after the end of the concerned monitoring period.

- c. Stove unique serial ID number
  - d. Stove Model
  - e. Stove distribution date
  - f. Type of old stove which the ICS replaced, i.e. the fuel type – wood or charcoal.
3. Envirofit performed cross-checks on the ICS sales information received from the dealers via CPA distribution records. The CME's logo is clearly displayed on the CPA Distribution Record, with a copy retained by Envirofit. A unique stove id is punched on each stove and the same serial ID is mentioned on the CPA distribution record. Therefore it is possible to identify each stove in the PoA with its unique serial ID number. The unique serial number linked to each stove and its association with a unique CPA bearing a CPA ID number eliminates any risk of double-counting of ICSs between CPAs.
  4. Envirofit obtained the customer's approval during distribution to exclusively assign carbon rights to the CME as per the disclaimer specified on all stove boxes/warranty cards
  5. Envirofit coordinated all ex-post monitoring activities in the PoA. In addition the Envirofit ;
    - a. Implemented the monitoring plan,
    - b. Determined the sample size as per sampling plan and identified the samples to be monitored
    - c. Ensured the quality of monitoring data (QA/QC) obtained from CEESD
    - d. Used this data for emissions reduction calculations.
  6. CEESD checked and recorded the following key parameters in a CPA Monitoring Record. Key monitored parameters were:
    - a. Efficiency of project stoves ( $\eta_{new}$ )
    - b. Check if project stoves are operational and in use (SOF)
    - c. Check fraction of end users continuing to use replaced stoves ( $f_{old}$ )
    - d. If replaced stoves are being used, the consumption accounted for by the old stoves ( $\mu_{old}$ )
  7. Envirofit calculated emission reductions based on monitoring data collected by CEESD and prepared monitoring report

Thus, by carrying out the aforesaid, Envirofit ensured that the PoA Operational and Management plan as given in section A.4.4.1 of registered PoA-DD is duly implemented for concerned CPAs.

## B.2. Implementation of single sampling plan(s)

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### a) List of CPAs to which the single sampling was applied

The eligible stoves distributed under the CPAs included in the PoA are as follows:

**Table 1: CPA and Stove Installation**

CPA	Scale	Type of Project stoves eligible under CPA	Total number of stoves in the CPA	CPA monitoring period covered under this PoA monitoring period
CPA0001	micro	Charcoal	9375 <sup>2</sup>	15/12/2013 – 24/10/2014

<sup>2</sup> Section A.2, page 2 of the registered CPA-DD, clearly mentions, "CPA will have a maximum energy saving of less than or equal to 60/180 GWh<sub>th</sub>/year, thus staying within the micro/small-scale threshold. Based on the **estimated** energy savings, it is envisaged that 4,500 number of stoves will be distributed under the CPA." It must be noted that the CPA-DD does not restrict or set a limit on the number of stoves that may be implemented under the CPA and the number of stoves mentioned in respective CPA-DD is only an indicative number. The number of cookstoves under the CPA can change ex-post during the crediting period based on monitored performance.

CPA00002	Small	Charcoal	0	15/12/2013 – 24/10/2014
CPA00003	Small	Woodfuel	3981	15/12/2013 – 24/10/2014

No eligible stoves were distributed in CPA0002 till the end of monitoring period. Hence, no ERs are being claimed for CPA0002 for this entire monitoring period. Only CPA00001 and CPA0003 have been monitored under the single PoA sampling plan for this monitoring period.

**a) Description of implemented single sampling design;**

Due to the large number of ICS distributed under the PoA it was not economically feasible to monitor each individual ICS unit distributed. Therefore, representative sampling was undertaken as part of a PoA-wide Sampling Plan. The sampling plan consisted of monitoring the following four parameters mentioned in section D.2.:

Sl.No.	Parameter	Description of parameter
1	$\eta_{new}$	The thermal efficiency of the ICS distributed (%)
2	SOF	The Stove Operating Fraction, i.e. the fraction of users using the ICS
3	$f_{old}$	The fraction of stove users still using baseline (replaced) stoves
4	$\mu_{old}$	The amount of woody biomass that continues to be used in the replaced stoves (kg)

Based on the registered PoA-DD and CPA-DD for CPA0001& CPA0003, 95/10 reliability level was selected for cross-CPA sampling for the parameters mentioned above.

As per page 53 of the PoA-DD, for the parameter  $\eta_{new}$ , the population of each stove model shall be deemed homogeneous across CPAs as the stoves have been designed to meet stringent efficiency specifications and are manufactured in factories to specification. Hence the sample size was calculated for  $\eta_{new}$  considering each stove model as separate population.

As per page 53 and page 57 of the PA-DD, for other parameters (SOF,  $f_{old}$ ,  $\mu_{old}$ ), the homogeneity of the population is demonstrated in compliance with the following conditions;

Homogeneity condition	Characteristic of Population	Status of population
Country	all units have been distributed in the same geographical area, i.e. Ghana	homogeneous
Fuel Type – charcoal / wood fuel	all units that have been distributed are charcoal stoves	homogeneous
End user – domestic / small-medium enterprises / community	all units are for domestic (household) usage as per their design	homogeneous
Stove Type - efficiencies are in a similar range defined as being within +/- 10% of each other and they have other common design features	the stove models disseminated have efficiencies within +/-10% of each other (CH2300 considered as the base model which constitutes more than 80% of the stove population)	homogeneous

Thus, the sample size calculations for parameters SOF,  $f_{old}$ ,  $\mu_{old}$  were calculated considering CPAs population as one sampling frame.

The following is the number of samples covered during the monitoring activity. Refer ER calculator worksheet 'MP#2 Sample Size Calculation' for more details on calculation of sample size for each parameter.

Parameter	Total population (N)	Expected results	Reliability	Required Sample Size (n)	Monitored samples
$\eta_{\text{new}}$ (CH2200)	2,131	33.0	95/10	7	10
$\eta_{\text{new}}$ (CH2300)	10,695	32.5	95/10	7	10
$\eta_{\text{new}}$ (CH5200)	530	36.2	95/10	7	10
SOF	13,356	80%	95/10	96	144
$f_{\text{old}}$	10,685	80%	95/10	96	131
$\mu_{\text{old}}$	2,137	2,250.00	95/10	18	43

The stoves were selected by randomly assigning a number to each stove and sorting in increasing order from lower to higher number. 175 random numbers were generated using online random number generator and the numbers obtained were used to identify the samples from the population. A higher number of samples were monitored than that required to ensure that the desired precision / confidence is achieved as well as have sufficient number of samples that use both ICS and baseline stove for determining  $\mu_{\text{old}}$

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

Data was collected for SOF,  $f_{\text{old}}$  and  $\mu_{\text{old}}$  following a specially design survey form. The information collected was introduced into an electronic database, the CPA Monitoring Record. This survey form was design in a way that would allow the surveyor first to check the validity of the records from the CPA Distribution Records, and secondly to collect the necessary information from field visit for the ER calculations. In order to achieve the 95/10 reliability level for cross-CPA sampling few additional stoves were sampled from the database than that required (as mentioned in the table above) to cover for non responses, if any.

As for the thermal efficiency of the stoves, water boiling tests were conducted using EPTP (a water boiling test protocol developed by Shell Foundation and Envirofit). Refer ER calculator worksheet "Monitoring Survey" and "WBT Data" for details on data collected during monitoring.

**b) Analysis of the collected data;**

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

Parameter	Results
SOF	0.910
$f_{\text{old}}$	0.237
$\mu_{\text{old}}$	1885 kg
$\eta_{\text{new}}$ (CH2200)	32.71%
$\eta_{\text{new}}$ (CH2300)	33.16%
$\eta_{\text{new}}$ (CH5200)	36.40%

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

The following tables demonstrate the status of precision/confidence for each of the monitored parameters:

$\eta_{\text{new}}$ CH2200	32.71%	%	Calculated
total number of stoves	2131	number	total number of stoves
Sample Size for ( $\eta_{\text{new}}$ CH2200)	10	number	Sample Size for ( $\eta_{\text{new}}$ CH2200)
Mean	32.7%	%	Mean
Standard Deviation	1.13%	%	Standard Deviation
Standard error of mean ( $\eta_{\text{new}}$ CH2200)	0.36%		Standard error of mean ( $\eta_{\text{new}}$ CH2200)
Precision for $\eta_{\text{new}}$ CH2200	2.14%		Precision for $\eta_{\text{new}}$ CH2200
Result for $\eta_{\text{new}}$ CH2200	ok, acceptable	--	Calculated

$\eta_{\text{new CH2300}}$	<b>33.16%</b>	<b>%</b>	<b>Calculated</b>
total number of stoves	10695	number	Installation Database
Sample Size for ( $\eta_{\text{newCH2300}}$ )	10	number	WBT data
Mean	33.2%	%	Calculated
Standard Deviation	1.77%	%	Calculated
Standard error of mean ( $\eta_{\text{newCH2300}}$ )	0.56%		Calculated
Precision for $\eta_{\text{newCH2300}}$	3.30%		Calculated
Result for $\eta_{\text{newCH2300}}$	ok, acceptable	--	Calculated

$\eta_{\text{new CH5200}}$	<b>36.40%</b>	<b>%</b>	<b>Calculated</b>
total number of stoves	530	number	Installation Database
Sample Size for ( $\eta_{\text{newCH5200}}$ )	10	number	WBT data
Mean	36.4%	%	Calculated
Standard Deviation	1.43%	%	Calculated
Standard error of mean ( $\eta_{\text{newCH5200}}$ )	0.45%		Calculated
Precision for $\eta_{\text{newCH5200}}$	2.42%		Calculated
Result for $\eta_{\text{newCH5200}}$	ok, acceptable	--	Calculated

<b>SOF</b>	<b>0.910</b>	<b>fraction</b>	<b>Calculated</b>
Population Size	13356	number	Population Size
Sample Size	144	number	Sample Size
Proportion for SOF	0.91	tonnes/y	Proportion for SOF
Standard error of proportion for SOF	2.38%	%	Standard error of proportion for SOF
Precision for SOF	5.12%	%	Precision for SOF
Result for SOF	ok, acceptable	--	Result for SOF

As per paragraph 11(a) of the Standard - Sampling and surveys for CDM project activities and programmes of activities,  $f_{\text{non old}}$  has been determined through sampling and  $f_{\text{old}}$  has been determined as  $f_{\text{old}} = 1 - f_{\text{non old}}$ .

$f_{\text{old}}$	<b>0.237</b>	<b>fraction</b>	<b>Calculated</b>
Population Size	12150	number	Population Size
Sample Size	131	number	Sample Size
Porportion for $f_{\text{non old}}$	0.76	tonnes/y	Porportion for $f_{\text{non old}}$
Standard error of proportion for $f_{\text{non old}}$	3.697%	%	Standard error of proportion for $f_{\text{non old}}$
Precision for $f_{\text{non old}}$	9.48%	%	Precision for $f_{\text{non old}}$
Result for $f_{\text{non old}}$	ok, acceptable	--	Result for SOF

$\mu_{\text{old}}$	<b>1.885</b>	<b>tonnes/year</b>	<b>Calculated</b>
Population Size	2875	number	Population Size
Sample Size	41	number	Sample Size
Mean for $\mu_{\text{old}}$	1.89	tonnes/y	Mean for $\mu_{\text{old}}$
Standard Deviation $\mu_{\text{old}}$	0.56	tonnes/y	Standard Deviation $\mu_{\text{old}}$
Standard error of mean $\mu_{\text{old}}$	8.64%	%	Standard error of mean $\mu_{\text{old}}$
Precision for $\mu_{\text{old}}$	8.99%	%	Precision for $\mu_{\text{old}}$

For detailed calculations refer ER calculator, worksheet 'Monitoring Survey'

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

Stoves were selected by randomly after arranging them in chronological order of date of sale and assigning a number to each stove. Random numbers were generated using a range from 1 to 13356 using online random number generator available at <http://stattrek.com/statistics/random-number-generator.aspx> and the random numbers received were selected from CPA0001 and CPA0003 distribution databases combined to identify the samples to be monitored. The approach ensured that the samples picked are random and represent the population.

**SECTION C. Post-registration changes to the PoA (including the generic CPA(s))**

**C.1. Corrections**

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Not Applicable

**C.2. Inclusion of a monitoring plan to the registered PoA-DD (including its generic CPA-DD(s)), if a monitoring plan was not included at the time of registration**

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Not Applicable

**C.3. Permanent changes to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline**

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Not Applicable

**C.4. Changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA**

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Not Applicable

**C.5. Types of changes specific to afforestation and reforestation activities**

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Not Applicable

**PART II- Specific-case component project activity(ies)**

**SECTION D. Description of specific-case CPA(s)**

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This Monitoring Report covers all the three CPAs included in the concerned monitoring period. These CPAs have the same project boundary and follow a common generic CPA as identified in section A.1.1, Part I of this monitoring report. The following sections therefore represent all these three CPAs.

**D.1. Brief description of implemented specific-case CPA(s)**

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

The purpose of the CDM Programme Activities (CPAs) is dissemination of improved cooking stoves (ICS) in the Republic of Ghana. The CPAs replace cooking stoves using charcoal / woodfuel with more efficient stoves using charcoal / woodfuel.

The project ICS are more efficient in transferring heat from the fuel to the pot, thus saving fuel compared to the baseline stoves which would have been used in the absence of the project activity.



Furthermore, the ICSs applied in these CPAs have been designed not only to increase heat transfer, but also to match traditional utensils and cooking habits of people in Ghana.

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

The Envirofit stoves have been designed with the specific intention of maximizing thermal efficiency while simultaneously minimizing the production of toxic emissions. While many interrelated factors need to be considered in order to achieve these goals, primary aspects of stove performance were explored during the development of the stoves: 1) fuel and air mixing 2) heat transfer to the pot. In order to maximize temperature, the combustion chamber shape, fuel amount, and air flow through the stove all need to be considered and correctly coordinated. In order to use the available thermal energy in the most efficient manner possible, specific stove geometry and configuration choices were made; including reducing stove thermal mass and minimizing heat flux through the sides and bottom of the stove. In order to minimize emissions, the combustion chamber shape, fuel amount, and air flow rate through the stove all need to be considered and correctly coordinated in order to maintain a proper air to fuel mixture.

The following table details the implementation status of the CPAs along with technology involved:

CPA	Type of Project stoves eligible	Stove models installed <sup>3</sup>	Total number of stoves installed
CPA00001	Charcoal	CH2200, CH2300	9,376
CPA00002	Wood fuel	--	0
CPA00003	Charcoal	CH2300, CH5200	3,982

The stove models referred above are shown below:



CH2200



CH2300



CH5200

Information required by Eligibility criteria

Eligibility criteria # 3, 4 and 11 that require information related to project technology / infrastructure are discussed below:

No.	Eligibility criteria		Assessment for CPAs	
	Description	Conditions to be met	Means of proof	Confirmation
#3	Applicability of Methodology AMS-II. G - Technology type	The ICS uses one of the following fuel types: <ul style="list-style-type: none"> <li>• Wood fuel</li> </ul>	Technical specification of ICS provided	Refer D.1 (b) above for the type and number of stoves distributed in the CPAs till the end of the monitoring period. All these models are charcoal stoves

<sup>3</sup>At the end of monitoring period

		• Charcoal		
#4	Applicability of Methodology AMS-II.G – Minimum ICS efficiency/ specifications of technology including the level and type of service	The ICS has a minimum efficiency of 20% (AMS-II.G, V.3, para 1)	Technical specification of ICS provided (either from manufacturer's specifications or test results using the Emissions & Performance Test Protocol (EPTP))	Already specified in the registered CPA-DD for CH2200 and CH2300. Manufacturer's specifications for CH5200 substantiate that the design efficiency of CH5200 is 37%
#11	SSC Limit for CPAs	The annual energy savings of each CPA shall not go beyond the limits of 180 GWh <sub>th</sub> /year over the entire crediting period.  In the case of using option 1 to prove additionality under Eligibility Criteria 7, the limit shall be 60 GWh <sub>th</sub> /year over the entire crediting period.	The maximum number of ICS will be determined in each CPA-DD depending on the technology used (excel sheet will be provided to show calculated energy savings). If a CPA exceeds the applicable limit in any year, the claimable emission reduction shall be capped based on the estimated GHG reductions in the CPA-DD).	Refer ER calculator, worksheet 'MP#2 ER Calculations' which calculates the annual energy savings in CPA0001 and CPA0003. While CPA0001 exceeds micro-scale threshold, CPA0003 remains within the small-scale threshold. The ERs from CPA0001 have accordingly been capped to the estimated GHG emissions in the CPA-DDs

For detailed information on complete list of eligibility criteria refer the CPA-DDs available on UNFCCC website as mentioned in Section A.1.2, Part I of this monitoring report.

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

Description	CPA0001	CPA0002	CPA0003	Reference
Start Date	03/01/2012	11/08/2013	06/06/2012	Respective CPA-DD
Date of first stove distribution	23/02/2012	--	20/06/2012	PoA / CPA distribution database

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

CPA	Emission Reductions tCO <sub>2</sub> e
CPA00001	13,314
CPA00002	0
CPA00003	7,028
<b>Total</b>	<b>20,342</b>

Each stove bears a unique serial ID punched on the stove. The same is recorded to trace the stove later and avoid double counting. Further, for each stove included under each CPA, information on the location of the stove has been collected by collecting address of the user at the time of sale in CPA Distribution Record. Thus, location of each stove in CPA distribution database can be traced. Please refer the ER calculator, worksheet 'CPA0001 Distribution data' and 'CPA0003 Distribution data' in which the sales information i.e. Stove unit details and the end user information for each stove is mentioned. The system of recording the unique serial on each stove along with its location serves toward avoiding couple counting of stoves amongst various CPAs.

## D.2. Geographical references or other means of identification of the location of the specific-case CPA(s)

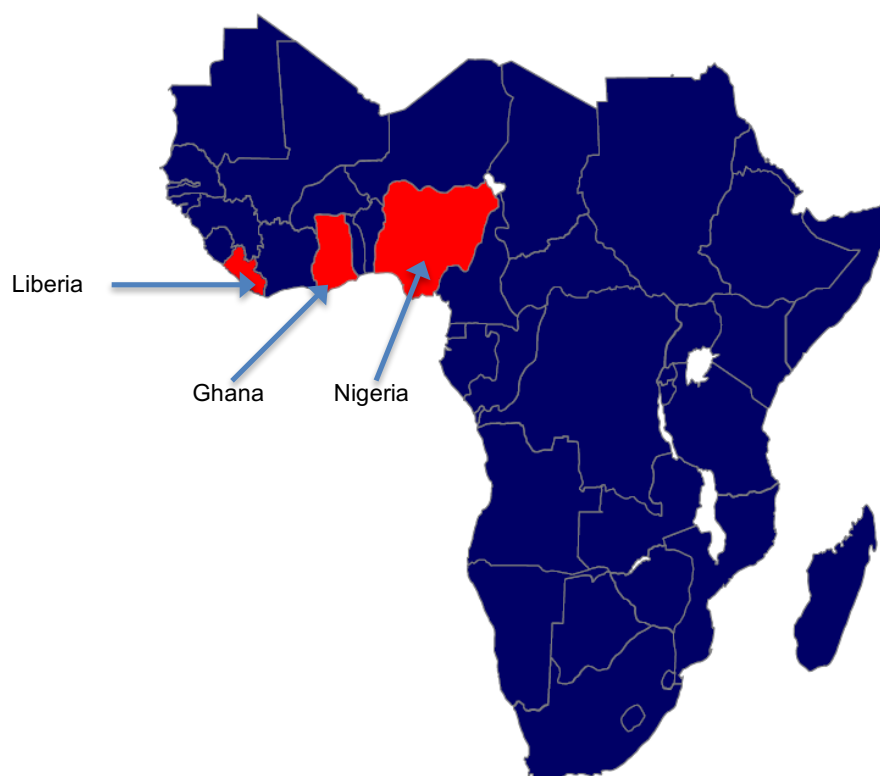
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Host Parties: Ghana, Nigeria and Liberia

Region/State/Province: All across Ghana, Nigeria and Liberia

City/Town/Community: All across Ghana, Nigeria and Liberia

Physical Geographical location: The geographical locations of Ghana, Nigeria and Liberia are depicted by the map below.



**Figure 1: Countries included in PoA boundary**

For the three CPAs included at the end of this first monitoring period, only Ghana is the host party.

**SECTION E. Post-registration changes to specific-case CPA(s)****E.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline**

&gt;&gt;

Not Applicable

**E.2. Corrections**

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Not Applicable

**E.3. Changes to the start date of the crediting period of the specific-case CPA(s)**

&gt;&gt;

Not Applicable

**E.4. Inclusion of a monitoring plan into the specific-case CPA(s) that was not included at registration**

&gt;&gt;

Not Applicable

**E.5. Permanent changes to the monitoring plan as described in the registered specific-case CPA-DD(s), applied methodology or standardized baseline**

&gt;&gt;

Not Applicable

**E.6. Changes to project design of the specific-case CPA(s)**

&gt;&gt;

Not Applicable

**E.7. Types of changes specific to afforestation and reforestation specific-case CPA(s)**

&gt;&gt;

Not Applicable

**SECTION F. Description of the monitoring system of specific-case CPA(s)**

&gt;&gt;

Stoves were either distributed to end-users by CEESD directly or via dealers sub-contracted. Any such third parties were trained by CEESD for ensuring correct procedures according to the PoA are fulfilled.

At the CPA level, CEESD ensured that necessary data was correctly obtained from the customer and recorded in the CPA Distribution Record, firstly to avoid double counting and secondly to enable tracking of the ICS for monitoring purposes. This data captured included:

- a. Name of customer
- b. Address / location of the customer
- c. Stove unique serial ID number
- d. Stove Model
- e. Stove distribution date
- f. Type of old stove which the ICS replaced, i.e. the fuel type – wood or charcoal.

All other monitoring activities have been carried out at the PoA level, single stage sampling plan.

**SECTION G. Data and parameters****G.1. Data and parameters fixed ex ante, at registration, inclusion or renewal of crediting period***(Copy this table for each piece of data and parameter)*

<b>Data/parameter</b>	<b>Q<sub>biomass</sub></b>
Unit	Tonnes/year
Description	Annual average biomass consumption per appliance
Source of data	Historical data from literature, as allowed by the methodology
Value(s) applied	4.36
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	Used for calculation of B <sub>old</sub>

<b>Data/parameter</b>	<b>f<sub>NRB,y</sub></b>
Unit	Fraction
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass.
Source of data	FAO and IPCC
Value(s) applied	0.99
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	

<b>Data/parameter</b>	<b>NCV<sub>biomass</sub></b>
Unit	TJ/tonne
Description	Net calorific value of the non-renewable biomass that is substituted
Source of data	AMS-II.G version 03
Value(s) applied	0.015
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	-

<b>Data/parameter</b>	<b>EF<sub>projected_fossilfuel</sub></b>
Unit	tCO <sub>2</sub> /TJ
Description	Emission factor for the substitution of non-renewable biomass by similar consumers
Source of data	AMS-II.G version 03
Value(s) applied	81.6
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	-

<b>Data/parameter</b>	<b><math>\eta_{old}</math></b>
Unit	Efficiency
Description	Efficiency of the system being replaced
Source of data	AMS-II.G version 03
Value(s) applied	0.101
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	

<b>Data/parameter</b>	<b>LAF</b>
Unit	Fraction
Description	Net to gross adjustment factor to account for leakages
Source of data	AMS-II.G version 03
Value(s) applied	0.95
Choice of data or measurement methods and procedures	As per registered CPA-DD
Purpose of data	Calculation of baseline emissions
Additional comments	-

**G.2. Data and parameters monitored**

*(Copy this table for each piece of data and parameter)*

<b>Data/parameter</b>	<b><math>\eta_{new}</math></b>												
Unit	Efficiency												
Description	Efficiency of the system being deployed as part of the project activity												
Measured/calculated/default	Measured												
Source of data	As determined through sample testing of stoves by performing WBTs												
Value(s) of monitored parameter	<table border="1"> <thead> <tr> <th>Stove model</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>CH2200</td> <td>32.71%</td> </tr> <tr> <td>CH2300</td> <td>33.16%</td> </tr> <tr> <td><b>CH5200</b></td> <td><b>36.40%</b></td> </tr> <tr> <td><b>Weighted Average CPA0001</b></td> <td><b>33.06%</b></td> </tr> <tr> <td><b>Weighted Average CPA0003</b></td> <td><b>33.59%</b></td> </tr> </tbody> </table>	Stove model	%	CH2200	32.71%	CH2300	33.16%	<b>CH5200</b>	<b>36.40%</b>	<b>Weighted Average CPA0001</b>	<b>33.06%</b>	<b>Weighted Average CPA0003</b>	<b>33.59%</b>
Stove model	%												
CH2200	32.71%												
CH2300	33.16%												
<b>CH5200</b>	<b>36.40%</b>												
<b>Weighted Average CPA0001</b>	<b>33.06%</b>												
<b>Weighted Average CPA0003</b>	<b>33.59%</b>												

Monitoring equipment	<p>Mini-thermometer:                      Brand: Omega                      Model: Omegaette HH308 Type K                      S/N:130707120                      Accuracy: +/- 0.3% reading +1°C</p> <p>Moisture measuring meter                      Brand: Lignomat                      Model: mini-LIGNO                      Accuracy: +/- 1%</p> <p>Mass balance                      Brand: TREE                      Model: LCT-33                      S/N: LC1305074                      Accuracy: +/- 2 division, +/- 0.002 lbs</p> <p>Those items were newly bought so no calibration was needed. Besides, those are self-calibrating equipment so measurements were done with the necessary guarantees.</p>
Measuring/reading/recording frequency	WBTs were carried out for a sample of installed ICSs in operation in line with the PoA Sampling Plan on an annual basis.
Calculation method (if applicable)	n/a
QA/QC procedures	WBTs were conducted in line with the guidance provided by the CME and according to a methodology supported by PCIA. Documentation can be found on PCIA website <a href="http://www.pciaonline.org/testing">http://www.pciaonline.org/testing</a>
Purpose of data	Calculation of baseline emissions
Additional comments	

<b>Data/parameter</b>	<b>N<sub>all</sub></b>
Unit	Number
Description	Total number of stoves installed
Measured/calculated/default	Calculated
Source of data	CPA Distribution Records and logbooks
Value(s) of monitored parameter	CPA0001: 8854 CPA0003: 3760
Monitoring equipment	n/a
Measuring/reading/recording frequency	<p>The DO maintained CPA Distribution Records which provided the data used to calculate this parameter. This data was uploaded to the PoA Distribution and Monitoring Database maintained by the CME.</p> <p>The recording of the sales was done in a regular basis during the crediting period and the monitoring in a yearly basis.</p>
Calculation method (if applicable)	Sum of all stove records in the CPA Distribution Records.
QA/QC procedures	The CME supervised the activities of the DO, and provided training, guidelines and distribution templates to facilitate accurate record keeping during the ICS distribution. The CME also maintained a record of the stove serial numbers supplied to the DO, and was able to cross-check these against the CPA Distribution Reports it receives back from the DO.
Purpose of data	Calculation of baseline emissions

Additional comments	Based on the monitoring survey results, the stove number in each CPA has been discounted by the fraction of samples that have reported using more than one EF stove.
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<b>Data/parameter</b>	<b>SOF</b>
Unit	Fraction
Description	Stove Operation Fraction – used to determine the share of distributed stoves that are still operating, measured ex-post through sampling
Measured/calculated/default	Measured
Source of data	Survey of end user behaviour as part of the PoA Sampling Plan
Value(s) of monitored parameter	0.91
Monitoring equipment	No specific monitoring equipment has been used for the surveys.
Measuring/reading/recording frequency	The actual value applied for emissions reduction calculations and request for issuance of CERs was measured ex-post by investigation of the number of ICS installations within the sampled ICS which are operational.  This was done on an annual basis as per the PoA monitoring requirements
Calculation method (if applicable)	Since 131 out of 144 stoves have been found to be in operation, SOF has been calculated as 131 divided by 144.
QA/QC procedures	The CME provided training, guidelines and monitoring templates to ensure that the Monitoring Organization responsible for monitoring followed appropriate procedures.
Purpose of data	Calculation of baseline emissions
Additional comments	-

<b>Data/parameter</b>	<b>f<sub>old</sub></b>
Unit	Fraction
Description	The fraction of end users that are still using baseline (replaced) stoves
Measured/calculated/default	Measured
Source of data	Survey data of end user behaviour as part of the PoA Sampling Plan
Value(s) of monitored parameter	23. 7%
Monitoring equipment	No specific monitoring equipment has been used for the surveys.
Measuring/reading/recording frequency	The actual value applied for emissions reduction calculations and request for issuance of CERs was measured ex-post by estimation of a representative sample of end users using the deployed ICS, as conducted in line with the PoA Sampling Plan.  Sampling estimated the value of this parameter through monitoring the fraction of end users not using baseline stoves ( $f_{non,old}$ ),  This was done on an annual basis as per the PoA monitoring requirements



Calculation method (if applicable)	Based on the registered CPA-DD, the fraction of users not using the baseline stoves ( $f_{non,old}$ ) has been monitored. Then $f_{old}$ has been calculated as $1 - f_{non,old}$
QA/QC procedures	The CME provided training, guidelines and monitoring templates to ensure that the Monitoring Organization responsible for monitoring followed appropriate procedures.
Purpose of data	Calculation of baseline emissions
Additional comments	-

<b>Data/parameter</b>	<b><math>\mu_{old}</math></b>
Unit	kg/year
Description	The amount of woody biomass consumption that is consumed through the continued use of old stoves
Measured/calculated/default	Measured
Source of data	Data from survey of end user behaviour as part of PoA Sampling Plan combined with the same source of data as for $Q_{biomass}$
Value(s) of monitored parameter	1,885 kg/year
Monitoring equipment	No specific monitoring equipment has been used for the surveys.
Measuring/reading/recording frequency	<p>The actual value applied for emissions reduction calculations and request for issuance of CERs was measured ex-post by estimation of a representative sample of end users using the deployed ICS, as conducted in line with the PoA Sampling Plan.</p> <p>During the survey, the interviewer conducted an interview with the end user to identify how much the baseline (replaced) stove as being used. The value of <math>\mu_{old}</math> will be estimated by comparing the number of meals per month before and after ICS distribution.</p> <p>This was done on an annual basis as per the PoA monitoring requirements</p>
Calculation method (if applicable)	Based on the registered CPA-DD, this parameter has been calculated by multiplying the Total Annual Fuel Consumption, 4,360 kg/year, by the ratio of meals cooked by the traditional stove in operation before and after purchasing the Envirofit Stove.
QA/QC procedures	The CME provided training, guidelines and monitoring templates to ensure that the Monitoring Organization responsible for monitoring followed appropriate procedures
Purpose of data	Calculation of baseline emissions
Additional comments	-

<b>Data/parameter</b>	<b>Stove<sub>year</sub></b>
Unit	Year
Description	Calculated average stove operation years in the monitoring period.
Measured/calculated/default	Calculated
Source of data	PoA Distribution and Monitoring Database
Value(s) of monitored parameter	CPA0001: 0.86 CPA0003: 0.65
Monitoring equipment	No specific monitoring equipment has been used for the surveys.

Measuring/reading/recording frequency	Each ICS entered into the PoA Distribution and Monitoring Database was linked to a distribution date (recorded during distribution). Thus for any monitoring period it is possible to calculate the period of time that the stoves included in the emissions reduction calculations for that period have been operating..  The recording of the sales date was done in a regular basis during the crediting period and the monitoring on an annual basis.
Calculation method (if applicable)	Average of all stove records in the CPA Distribution Records.
QA/QC procedures	The CME was responsible for overseeing the collection of data by DOs during distribution, training the DOs in correct data recording practices, maintaining a secure Database, and back up of files contained in the Database.
Purpose of data	Calculation of baseline emissions
Additional comments	-

**G.3. Implementation of specific-case CPA level sampling plan**

>>

A single sampling plan covering all specific-case CPAs covered in this monitoring report has been undertaken to estimate parameter values, therefore, this section is not applicable. Refer Section B.2 and the ER calculation spreadsheet.

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

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

>>

$$ER_y = B_{y,savings} \cdot f_{NRB} \cdot NCV_{biomass} \cdot EF_{projected\ fossil\ fuel}$$

$$B_{y,savings} = B_{old} \cdot \left(1 - \frac{\eta_{old}}{\eta_{new}}\right)$$

$$B_{old} = LAF \cdot N_{all} \cdot SOF \cdot \left(Q_{biomass} - \left(\frac{\mu_{old}}{1000} \cdot f_{old}\right)\right) \cdot Stove_{year}$$

Data Ex Ante	Value	Unit	Source	
Q <sub>biomass</sub> (charcoal)	4.36	tonne/year	Ex-ante, CPA-DD	
Q <sub>biomass</sub> (Firewood)	-			
f <sub>NRB</sub>	0.99	fractio	Ex-ante, CPA-DD	
NCV <sub>biomass</sub>	0.015	TJ/tonne	Ex-ante, CPA-DD	
EF <sub>fossil_fuel</sub>	81.6	tCO <sub>2</sub> /TJ	Ex-ante, CPA-DD	
Efficiency <sub>old</sub> (charcoal)	0.101	fraction	Ex-ante, CPA-DD	
Efficiency <sub>old</sub> (firewood)	-			
LAF	0.95	fraction	Ex-ante, CPA-DD	
Data Ex Post	Value	Unit	Source	
<b>Monitored</b>				
Efficiency <sub>new CH2200</sub>	32.71%	%	Monitored - "WBT data"	
Efficiency <sub>new CH2300</sub>	33.16%	%	Monitored - "WBT data"	
Efficiency <sub>new CH5200</sub>	36.40%	%	Monitored - "WBT data"	
SOF	0.91		Monitored - "Monitoring Survey"	
f <sub>old</sub>	0.24		Monitored - "Monitoring Survey"	
H <sub>old</sub>	1885	kg/year	Monitored - "Monitoring Survey"	
Data Ex Post	CPA0001	CPA0003	Unit	Source
N <sub>CH2200</sub>	2131	0	number	Monitored - "CPA0001 Distribution data" and "CPA0003 Distribution data"
N <sub>CH2300</sub>	7244	3451	number	Monitored - "CPA0001 Distribution data" and "CPA0003 Distribution data"
N <sub>CH5200</sub>	0	530	number	Monitored - "CPA0001 Distribution data" and "CPA0003 Distribution data"
N <sub>all</sub>	8854	3760	stoves	Calculated
STOVE <sub>year</sub>	0.86	0.65	fraction	Calculated
Efficiency <sub>new</sub>	33.06%	33.59%		Calculated
B <sub>old</sub>	25764.91	8252.96	t biomass	Calculated
B <sub>ysavings</sub>	17,893.8	5,771.7	t biomass	Calculated
Annual Energy savings	86.66	37.06	GWh	Calculated
Scale?	Micro	Small	-scale	
Capacity Utilization	144%	21%		Calculated
CPA-DD ER cap	13314	40,439	tCO <sub>2</sub> e	calculated
ER <sub>y</sub>	13,314	7,028	tCO <sub>2</sub> e	Calculated

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

>>

As explained above, the methodology directly provides equation for emission reductions; without separate baseline, project or leakage emission reduction equations. Calculation of Emission Reductions has already been explained above as per the methodology. Thus, this section is not applicable

## H.3. Calculation of leakage

>>

As explained above, the methodology directly provides equation for emission reductions; without separate baseline, project or leakage emission reduction equations. Calculation of Emission Reductions has already been explained above as per the methodology. Thus, this section is not applicable.

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

Specific-case CPA reference number	Baseline emissions or baseline net GHG removals by sinks (tCO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (tCO <sub>2</sub> e)	Leakage (tCO <sub>2</sub> e)	GHG emission reductions or net GHG removals by sinks (tCO <sub>2</sub> e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
5342-0001	13,314	0	0	0	13,314	13,314
5342-0002	0	0	0	0	0	0
5342-0003	7,028	0	0	0	7,028	7,028
<b>Total</b>	<b>20,342</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>20,342</b>	<b>20,342</b>

**H.5. Comparison of GHG emission reductions or net GHG removals by sinks with estimates in the included CPA-DD(s)**

Specific-case CPA reference number	Value estimated in ex ante calculation in the included CPA-DD(s)	Actual values achieved by the specific-case CPA(s) during this monitoring period
5342-0001	13,314	13,314
5342-0002	0	0
5342-0003	40,439	7,028
<b>Total</b>	<b>53,753</b>	<b>20,342</b>

**H.6. Remarks on difference from the estimated value in the included CPA-DD(s)**

&gt;&gt;

There is no increase in the GHG emission reductions or net GHG removals by sinks achieved by the specific-case CPA(s) during this monitoring period.

## Appendix 1. Contact information of coordinating/managing entity and/or responsible persons/entities

<b>Coordinating/managing entity and/or responsible person/entity</b>	<input checked="" type="checkbox"/> Coordinating/managing entity <input type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
<b>Organization name</b>	Envirofit International Ltd.
<b>Street/P.O. Box</b>	109 N Colleague Ave Suite 200
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<b>E-mail</b>	-
<b>Website</b>	<a href="http://www.envirofit.org">www.envirofit.org</a>
<b>Contact person</b>	Nathan Lorenz
<b>Title</b>	Vice-president - Engineering
<b>Salutation</b>	-
<b>Last name</b>	Lorenz
<b>Middle name</b>	-
<b>First name</b>	Nathan
<b>Department</b>	-
<b>Mobile</b>	-
<b>Direct fax</b>	+1 970 221-2874
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<b>Coordinating/managing entity and/or responsible person/entity</b>	<input type="checkbox"/> Coordinating/managing entity <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
<b>Organization name</b>	Envirofit International Ltd.
<b>Street/P.O. Box</b>	109 N Colleague Ave Suite 200
<b>Building</b>	-
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<b>Contact person</b>	Rohit Lohia
<b>Title</b>	Carbon Project Development Manager

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<b>Middle name</b>	-
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### Document information

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01.0	1 April 2015	Initial publication.

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