



**Monitoring report form for CDM programme of activities**  
**(Version 03.0)**

*Complete this form in accordance with the instructions attached at the end of this form.*

**MONITORING REPORT**

<b>Title of the PoA</b>	Up Energy Improved Cookstove Programme, Uganda	
<b>UNFCCC reference number of the PoA</b>	9956	
<b>Version numbers of the PoA-DD applicable to this monitoring report</b>	4.0	
<b>Version number of this monitoring report</b>	3.0	
<b>Completion date of this monitoring report</b>	18/09/2019	
<b>Monitoring period number</b>	Fourth Monitoring Period	
<b>Duration of this monitoring period</b>	01/11/2017 – 15/08/2018	
<b>Monitoring report number for this monitoring period</b>	1.0	
<b>Coordinating/managing entity</b>	UpEnergy Group	
<b>Host Parties</b>	<b>Host Party of the PoA</b>	<b>Is this the host Party of a CPA covered in this monitoring report? (yes/no)</b>
	Uganda	Yes
<b>Applied methodologies and standardized baselines</b>	AMS-II.G.: "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass" (Version 05.0)  Standardized baseline: Not applicable	
<b>Sectoral scopes</b>	Sectoral Scope 3: Energy Demand	
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period</b>	<b>Amount achieved before 1 January 2013</b>	<b>Amount achieved from 1 January 2013</b>
	NA	163,456 tCO <sub>2</sub> e
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report</b>	425,809 tCO <sub>2</sub> e	

## PART I Monitoring of programme of activities (PoA)

### SECTION A. Description of PoA

#### A.1. General description of PoA

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The PoA is located in the Republic of Uganda and involves distribution of efficient biomass fired Improved Cookstoves (ICS). The project ICSs replace the lower efficiency, traditional biomass fired stoves, used for meeting similar thermal energy needs in the baseline.

Uganda is considered by the UN to be a Least Developed Country. 94.8% population uses wood or charcoal for cooking<sup>1</sup>. The target areas are all regions with traditional biomass stove users. The consumption of non-renewable biomass for fuel, in the form of both wood and charcoal derived from wood, consumes high proportion of beneficiaries' income and time through fuel collection and purchase. Fuel harvest leads to deforestation and erosion and threatens habitat in Uganda.

#### *Policy/measure or stated goal of the PoA*

The purpose of the PoA is to facilitate the transition away from inefficient traditional biomass fired stoves, by providing high-efficiency and clean combustion ICS that reduce wood and charcoal consumption. Several greenhouse gases (GHG), including carbon dioxide, are produced as a result of the combustion of non-renewable biomass used in baseline cooking stoves. The project ICS improve heat transfer efficiency thereby reducing the amount of fuel consumed by ICS beneficiaries. Thus, the PoA supports the intended goals of reducing fuel consumption, improving health, and reducing deforestation in Uganda.

The PoA is being coordinated by UpEnergy Group (hereby UpEnergy), the Coordinating Managing Entity (hereby CME), which is the project participant providing the framework and incentives for the rest of parties involved to achieve the emission reductions. The CME communicates with the Executive Board and/or the pertinent DOE on all matters.

#### A.1.1. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014	Version: 04	Sectoral scope 3: Energy demand	AMS-II.G: "Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass" (Version 05.0)

#### A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Version of the PoA-DD	Title and reference number of the corresponding generic CPA	Crediting period type and duration	Covered in this monitoring report? (yes/no)
Up Energy Improved Cookstoves Programme, Uganda – CPA No 001 9956-P1-0001-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	22/07/2014 – 21/07/2021 (Renewable)	Yes
Up Energy Improved Cookstoves Programme, Uganda – CPA No 002 9956-P1-0002-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	17/03/2015 – 16/03/2022 (Renewable)	Yes

<sup>1</sup> Uganda Demographic and Health survey Report, January 2018, table 2.4

Up Energy Improved Cookstoves Programme, Uganda – CPA No 003 9956-P1-0003-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	17/04/2015 – 16/04/2022 (Renewable)	Yes
Up Energy Improved Cookstoves Programme, Uganda – CPA No 004 9956-P1-0004-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	17/04/2015 – 16/04/2022 (Renewable)	Yes
Up Energy Improved Cookstoves Programme, Uganda – CPA No 005 9956-P1-0005-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	01/01/ 2017 – 31/12/2023 (Renewable)	Yes
Up Energy Improved Cookstoves Programme, Uganda – CPA No 006 9956-P1-0006-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	01/01/ 2017 – 31/12/2023 (Renewable)	Yes
Up Energy Improved Cookstoves Programme, Uganda – CPA No 007 9956-P1-0007-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	01/01/ 2017 – 31/12/2023 (Renewable)	Yes
Up Energy Improved Cookstoves Programme, Uganda – CPA No 008 9956-P1-0008-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	01/01/ 2017 – 31/12/2023 (Renewable)	Yes
Up Energy Improved Cookstoves Programme, Uganda – CPA No 009 9956-P1-0009-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	15/07/ 2017 – 14/07/2024 (Renewable)	Yes
Up Energy Improved Cookstoves Programme, Uganda – CPA No 0010 9956-P1-0010-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	20/08/ 2017 – 19/08/2024 (Renewable)	Yes
Up Energy Improved Cookstoves Programme, Uganda – CPA No 0011 9956-P1-0011-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	25/09/ 2017 – 24/09/2024 (Renewable)	Yes
Up Energy Improved Cookstoves Programme, Uganda – CPA No 0012 9956-P1-0012-CP1	Version: 04	Up Energy Improved Cookstove Programme, Uganda Date: 30/06/2014 Part II	21/10/ 2017 – 20/10/2024 (Renewable)	Yes

No CERs are being claimed neither will they be claimed in future for CPAs 9956-P1-0006-CP1 to 9956-P1-0012-CP1 for period prior to 01/11/2017.

## A.2. Coordinating/managing entity

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Mr. Erik Wurster  
Up Energy Uganda Ltd. (CME)  
Email: [erik@upenergygroup.com](mailto:erik@upenergygroup.com)

## SECTION B. Implementation of PoA

### B.1. Description of implemented PoA

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UpEnergy is the Coordinating and Managing Entity (CME) for the PoA and the CPA Implementer of the CPAs covered in the MR. The Implementation of the PoA followed the following management system.

1. The CME / CPA implementer (CPAI) provided guidance / training / instructions to local sales and distribution partner (SDP) to collect requisite sales / installation data. The SDP sales staff compiled the list of units installed / distributed along with other required information and transferred the same to the electronic database management system at regular intervals managed by CME / CPAI.
2. The CPAI operated and managed the electronic database with information on units installed / distributed under the CPAs, as received from the sales staff. The electronic database contains the following information for each installation / distribution:
  - CPA Identifier
  - Location (Name and address of user, contract details, if available)
  - Unique serial number of the unit installed
  - Stove model and quantity
  - Date of installation / distribution
3. The CME / CPAI ensured that end users are aware of, and have agreed, that their unit is being subscribed to the PoA through warranty cards clearly stating the same.
4. The CME / CPAI ensured that there is no double counting of any unit in the electronic database by means of unique serial number associated with each unit.
5. The CME / CPAI coordinated all ex-post monitoring activities in the PoA. The CME / CPAI:
  - Implemented the monitoring plan,
  - Determined the sample size as per sampling plan and identified the samples to be monitored (a single sampling plan has been applied to CPA 9956-P1-0001 to CP1 – 9956-P1-0012-CP1 as detailed in section E.3 below), if applicable
  - Provided monitoring templates and training for field monitoring
6. The monitoring team recorded the following key parameters in a CPA Monitoring Record as per templates provided by CME /CPAI. Key monitored parameters were:
  - Operational Status of sampled ICS (in use / out of use)
  - Presence of baseline stoves and extent of their usage relative to project stove in sampled beneficiaries
  - Thermal efficiency of project ICS
7. The CME / CPAI, with support from external experts, checked and reviewed the monitoring data and calculated the emission reductions based on precision / reliability levels achieved for the monitored parameters.
8. The CME / CPAI, with support from external experts, calculated of emission reductions based on monitoring data collected and prepared the monitoring report.

**B.2. Post-registration changes to PoA****B.2.1. Corrections**

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N/A

**B.2.2. Inclusion of monitoring plan**

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N/A

**B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents**

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N/A

**B.2.4. Changes to programme design**

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N/A

**B.2.5. Changes specific to afforestation or reforestation activities**

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N/A

**PART II Monitoring of CPAs**

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This Monitoring Report covers twelve CPAs under the PoA, as included in the concerned as listed in section A.1.2. These 12 CPAs are deemed homogeneous due to the following:

1. Have the same project boundary/country (i.e. Uganda)
2. Follow same generic CPA-DD, as listed in section A.1.1 above
3. Implement the same technology / measure (i.e. improved ICS).

Thus, these CPAs have been sub-grouped for monitoring purposes. The following sections of the monitoring report present information pertaining to these 12 CPAs.

**SECTION C. Implementation of CPAs****C.1. Description of implemented CPAs**

&gt;&gt;

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

Purpose: The CPAs involve the promotion and distribution of improved biomass stoves in Uganda for use by households. The ICS disseminated through this programme replace the conventional inefficient biomass stove (3-stone fire)/traditional charcoal stoves with ICS which combust biomass more efficiently and improve heat transfer to pots, hence reducing use of non-renewable fuel and equivalent greenhouse gas emissions.

Measures taken: The CPAs involve marketing, distribution, and creating awareness for improved cook stoves for low income households in Uganda. The ICSs provide clean, renewable power for cooking. The total number of ICS included under these CPAs are as follows:

S.No.	CPA Reference No.	Number of ICS Distributed
1	9956-P1-0001-CP1	11,299
2	9956-P1-0002-CP1	13,422
3	9956-P1-0003-CP1	14,632
4	9956-P1-0004-CP1	13,898
5	9956-P1-0005-CP1	17,000
6	9956-P1-0006-CP1	17,000
7	9956-P1-0007-CP1	17,000
8	9956-P1-0008-CP1	17,000
9	9956-P1-0009-CP1	12,551
10	9956-P1-0010-CP1	542
11	9956-P1-0011-CP1	482
12	9956-P1-0012-CP1	224
<b>Total</b>		<b>135,050</b>

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

The Ezy Stove contains a metal construction consisting of a cylindrical combustion chamber and surrounded by an outer body. The overall design is small and portable, enabling it to be easily transported.

The AES, SHS, SHS-GBE, SHS-BOLD, SHS-ILF, Lugwana, SpendSmart and Energy Empire stoves consist of a metal frame (called cladding) with perforated interior ceramic liner that allows ash to fall to the collection chamber at the base. A thin layer of cement is placed between the cladding and the liner to bind the two. During use, a single pot rests at the top the stove.

The materials used in the stoves are from readily available local materials requiring limited tools and training to the manufacture. The stoves are assembled locally in Uganda according to specific design parameters and dimensions, providing for uniform performance between units. These ICSs are illustrated below:



Specifications of ICSs included in the CPAs is as follows:

Stove Type	Type of Fuel	Type of stove	Service Level	Grate /Chimney	Thermal Efficiency
EZY	Wood	Portable	Domestic	Grate	23.39%
SHS	Charcoal	Portable	Domestic	Grate	24.90%
AES	Charcoal	Portable	Domestic	Grate	24.28%
SHS-GBE	Charcoal	Portable	Domestic	Grate	30.00%
SHS-BOLD	Charcoal	Portable	Domestic	Grate	37.30%
SHS-ILF	Charcoal	Portable	Domestic	Grate	38.00%
Lugwana	Charcoal	Portable	Domestic	Grate	35.00%
SpendSmart	Charcoal	Portable	Domestic	Grate	36.30%
Energy Empire	Charcoal	Portable	Domestic	Grate	33.00%

Distribution of ICSs included in the CPAs is as follows:

Stove Distribution (Model & CPA wise)										Grand Total
Year	AES	EZY	SHS	SHS-GBE	SHS-ILF	SHS-BOLD	Lugwana	ENERGY EMPIRE	SpendSmart	
CPA-01	0	11299	0	0	0	0	0	0	0	11299
CPA-02	1289	0	12133	0	0	0	0	0	0	13422
CPA-03	2022	0	12610	0	0	0	0	0	0	14632
CPA-04	2240	0	11658	0	0	0	0	0	0	13898
CPA-05	682	0	8780	6926	612	0	0	0	0	17000
CPA-06	773	0	0	10983	2081	737	1939	471	16	17000
CPA-07	157	0	0	6949	2072	1728	2590	2997	507	17000
CPA-08	0	0	0	5172	1900	2105	2017	4978	828	17000
CPA-09	0	0	0	3390	1148	2171	1475	3717	650	12551
CPA-10	0	0	0	0	0	0	542	0	0	542
CPA-11	0	0	0	0	482	0	0	0	0	482
CPA-12	0	0	0	0	0	0	0	0	224	224
Grand Total	7163	11299	45181	33420	8295	6741	8563	12163	2225	135050

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

S.No.	CPA Reference No.	CPA Start Date (as per registered CPA-DD)	Crediting Period Start Date
1	9956-P1-0001-CP1	02/01/13	22/07/2014
2	9956-P1-0002-CP1	09/05/14	17/03/2015
3	9956-P1-0003-CP1	02/04/15	17/04/2015
4	9956-P1-0004-CP1	02/04/15	17/04/2015
5	9956-P1-0005-CP1	04/05/16	01/01/2017
6	9956-P1-0006-CP1	07/06/16	01/01/2017
7	9956-P1-0007-CP1	05/07/16	01/01/2017
8	9956-P1-0008-CP1	09/08/16	01/01/2017
9	9956-P1-0009-CP1	20/06/17	15/07/2017
10	9956-P1-0010-CP1	20/07/17	20/08/2017
11	9956-P1-0011-CP1	22/08/17	25/09/2017
12	9956-P1-0012-CP1	25/09/17	21/10/2017

d) Total GHG emission reductions achieved in this monitoring period for the CPA, including information on how double counting is avoided



The total GHG emission reductions achieved in this monitoring period for the CPAs are as follows:

S.No.	CPA Reference No.	GHG Emission Reductions (tCO <sub>2</sub> )
1	9956-P1-0001-CP1	19,360
2	9956-P1-0002-CP1	22,997
3	9956-P1-0003-CP1	25,071
4	9956-P1-0004-CP1	23,813
5	9956-P1-0005-CP1	29,096
6	9956-P1-0006-CP1	21,793
7	9956-P1-0007-CP1	13,120
8	9956-P1-0008-CP1	7,027
9	9956-P1-0009-CP1	1,179
10	9956-P1-0010-CP1	0
11	9956-P1-0011-CP1	0
12	9956-P1-0012-CP1	0
	<b>Total</b>	<b>163,456</b>

Each stove has a unique identification number. The same is recorded to trace the stove ex-post and avoid double counting. Further, for each stove included under each CPAs, information on the location of the stove is collected by recording end user information (name, address, contact detail etc). Please refer the sales database in which the sales information i.e. Stove unit details and the end user / partner information for stove is mentioned. The system of recording the unique serial on each stove along with its location serves toward avoiding double counting of stoves amongst various CPAs.

## C.2. Location of CPAs

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The geographical boundaries of all the 12 CPAs covered in the monitoring report is the national borders of Uganda, which is same as the boundary of the PoA.



The GPS Co-ordinates and location of CPAs are as follows:

- Host Party = Uganda
- Region/state/province = All the regions of Uganda
- City/town/community = All the cities of Uganda
- Latitude and Longitude



Boundary	Latitude	Longitude
Northern	4.228950	33.989650
Eastern	1.925300	35.044333
Southern	-1.481383	29.915233
Western	-1.186633	29.572667

### C.3. Post-registration changes to CPAs

#### C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies, standardized baselines or other methodological regulatory documents

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N/A

#### C.3.2. Corrections

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The following corrections have been proposed from CPA 9956-P1-0006-CP1 to CPA 9956-P1-0012-CP1:

1. Several typographic corrections have been made.
2. Appendix 3 of CPA-DD: Applicability of the selected methodology(ies) has been added to Appendix 3 of the revised CPA-DDs in light of change in the CPA-DD template.
3. Reference to Section and Figure numbers are corrected according to latest version (v 09) of the CDM-CPA-DD-FORM.
4. To comply with the requirement of latest version (v 09) of the CDM-CPA-DD-FORM, few Sections have been improved.

The aforesaid changes were approved on 17 September 2019 (Effective approval date: 16 September 2019). The approval can be viewed at:

<https://cdm.unfccc.int/PRCContainer/DB/prcp614688312/view>

No corrections in this monitoring period have been made to CPA 9956-P1-0001-CP1, CPA 9956-P1-0002-CP1, CPA 9956-P1-0003-CP1 CPA 9956-P1-0004-CP1 and CPA 9956-P1-0005-CP1.

#### C.3.3. Changes to the start date of the crediting period

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N/A

#### C.3.4. Inclusion of monitoring plan

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N/A

#### C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

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The following changes to the included monitoring plan of the CPA 9956-P1-0006-CP1 to 9956-P1-0012-CP1 have been made.

1. Revision of Ex-ante parameter value for  $B_{old}$  (Quantity of woody biomass used in the absence of the project activity in tonnes per household, tonnes wood/ HH-year)

The CPAs define  $B_{old}$  value as follows:

<b>Description</b>	<b>9956-P1-0006-CP1 to 9956-P1-0012-CP1</b>
<b>Ex-ante parameter value for B<sub>old</sub> (tonne wood /HH-year) specified in included CPA-DD</b>	7.02 for urban population
<b>Proposed Revision in revised CPA-DD</b>	4.97 for entire CPA population
<b>Conservative Justification</b>	<p>1. The “Appendix - 2 Baseline Study Up Energy Uganda CPA No 001”, submitted at the time of PoA registration to CDM-EB and available at: <a href="https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/1TX2IRHF0B5VGDQPWSC4MUJKLEAZ63/view">https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/1TX2IRHF0B5VGDQPWSC4MUJKLEAZ63/view</a>, page 7, mentions 85% Ugandan population as rural.</p> <p>2. The latest Ugandan census 2014, table 2.7, page 12, <a href="http://uganda.unfpa.org/sites/default/files/pub-pdf/CENSUS%202014%20Final%20Results_0.pdf">http://uganda.unfpa.org/sites/default/files/pub-pdf/CENSUS%202014%20Final%20Results_0.pdf</a> gives the rural population as 78.5% (total Urban population = 7,425,864, total rural population = 27,208,786)</p> <p>CPA 06 - 12 population is primarily Urban. However, in light of some samples from earlier CPAs (02, 03 and 04) reporting themselves as rural in MP#2, the PP decided to revise the B<sub>old</sub> value to the most conservative value possible i.e. 4.97 tonnes/HH-year for 100% CPA population instead.</p> <p>Hence the revised B<sub>old</sub> value of 4.97 tonnes/HH-year for 100% entire CPA population is deemed conservative.</p>
<b>Compliance with applied methodology (para 266 of VVS for PoA, v2.0)</b>	Yes - The Ex-ante parameter value for B <sub>old</sub> is in compliance with AMS II.G. version 5.0. (the methodology allows use of historical data or survey of local usage to define relevant baseline appliance types as described in the baseline scenario. The CPAs utilize a survey of local usage to establish B <sub>old</sub> for the target user group “Residential” biomass stove users as provided in CPA-DD Appendix 3.
<b>Reduction in accuracy of monitoring compared to requirements contained in registered monitoring plan (para 266 of VVS for PoA, v2.0)</b>	No - The revision in the ex-ante parameter value does not reduce the accuracy of the monitoring compared to monitoring requirements contained in registered monitored plan. The proposed revision applies the lower of the two values for B <sub>old</sub> to entire CPA population irrespective of their category (urban / rural) as a conservative measure
<b>Reduction in the accuracy of the calculation of GHG emission reductions or net anthropogenic GHG removals (para 267 of VVS for PoA, v2.0)</b>	No - The revision in the ex-ante parameter value does not reduce the accuracy of ER calculations. The proposed revision applies the lower of the two values for B <sub>old</sub> to entire CPA population irrespective of their category (urban / rural) as a most conservative measure / assumption.
<b>Date of Approval</b>	17 September 2019 (Effective approval date: 16 September 2019). <a href="https://cdm.unfccc.int/PRCContainer/DB/prcp614688312/view">https://cdm.unfccc.int/PRCContainer/DB/prcp614688312/view</a>

The CPA description does not limit the CPA to Urban / Rural population and only refer to residential users. Thus, the CPA by virtue of the description in section A.1 (General description of CPA), A.3 (Technologies/measures) and F (Eligibility for inclusion) are open to all residential users alike (i.e. urban or rural) hence the aforesaid is not deemed as changes to project design.

Also, although the ex-ante parameter value is being revised, it is not deemed a permanent correction as the change is not attributed to mistake but is being revised as a conservative measure.

## 2. Changes to the sampling plan in light of above, to remove reference to urban / rural users.

The CPAs define sampling plan as follows:

Description	9956-P1-0006-CP1 to 9956-P1-0012-CP1-
<b>Sampling frame defined in included CPA-DD</b>	Sampling Frame for CPA is: Uganda-Urban / Smart Home Charcoal / Residential Different sample groups could be formed to ensure sample populations were homogenous
<b>Proposed Revision in revised CPA-DD</b>	Sampling Frame for CPA is: Uganda / ICS Type / Residential
<b>Compliance with applied methodology (para 266 of VVS for PoA, v2.0)</b>	Yes – The revised approach follows the confidence / precision requirements prescribed by the methodology for annual / biennial monitoring / sampling.
<b>Reduction in accuracy of monitoring compared to requirements contained in registered monitoring plan (para 266 of VVS for PoA, v2.0)</b>	No – The proposed revision eliminates the variation in the CPA population on the basis of region (baseline consumption 7.02 tonnes/HH-year for urban and 4.97 tonnes/HH-year for rural) by prescribing a single value of 4.97 tonnes/HH-year for entire CPA population. The CPA population no more remains heterogeneous on the basis of region and becomes homogenous wrt to region (wrt the associated baseline consumption).  This removes the need for separate sampling frames for Urban and Rural regions as a common baseline is now applicable to both the regions alike. Hence any reduction in accuracy is not deemed effected and the proposed revision is deemed conservative in light of application of rural population weightage of 100% for B <sub>old</sub> .
<b>Reduction in the accuracy of the calculation of GHG emission reductions or net anthropogenic GHG removals (para 267 of VVS for PoA, v2.0)</b>	No – The revision in the sampling approach will not reduce the accuracy of ER calculations. The proposed revision eliminates the variation in the CPA population on the basis of region (baseline consumption 7.02 tonnes/HH-year for urban and 4.97 ton/HH-year for rural) by prescribing a single value of 4.97 tonnes/HH-year for entire CPA population. Thus, irrespective of the region, the same B <sub>old</sub> value will be applied for ER calculations for both regions alike.
<b>Date of Approval</b>	17 September 2019 (Effective approval date: 16 September 2019). <a href="https://cdm.unfccc.int/PRCContainer/DB/prcp614688312/view">https://cdm.unfccc.int/PRCContainer/DB/prcp614688312/view</a>

**C.3.6. Changes to project design**

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N/A

**C.3.7. Changes specific to afforestation or reforestation CPA**

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N/A

**SECTION D. Description of monitoring system of CPAs**

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All the 12 CPAs apply the same monitoring system. The monitoring system applied involves a number of key elements to ensure that the CME and CPA-Implementer have high-quality, unbiased and reliable information regarding the performance of the project.

**Monitored Systems**

**1.Total Sales Record:** The total sales record documents the information listed below for the technologies implemented. A carbon waiver including a warranty card has been distributed with the ICSs sold. The CME makes every effort to retrieve this information (paper form or electronically (i.e. SMS) but cannot guarantee the collection of information for waivers and warranties with every stove due to challenges such as high rates of illiteracy and logistical challenges. The total sales record has been kept electronically and with supporting evidence from paper records, and/or SMS tracking records. The Total Sales Record contains:

- a. Model of project technology sold
- b. Quantity of units sold
- c. Unique identification of units sold (stove serial number)
- d. Date of sale
- e. End user contact details (name, address, phone number)

*Frequency:* Continuous

Every ICS listed in the Total Sales Record is transferred into the Project Database as needed, limited to the maximum threshold for this CPA is reached. In addition to the information provided in the Total Sales Record, the CPA-specific Project Database records user details for all, or a subset of all, appliances deployed.

## 2.Ex-post sample-based monitoring

Monitoring surveys conducted on households to check the usage rate and thermal efficiency of project ICS. The households found using project ICS, were also investigated for the extent to which baseline traditional stoves were still in use. If it is found that a traditional stove is still used, even in a secondary role, the HHs are encouraged to discard their traditional stove through the Disposal Policy. Besides, the relative usage of baseline stove wrt to project stove is determined and is considered in ER calculations to ensure that the fuel-wood consumption of baseline stoves is excluded from  $B_{old}$ .

## 3.Organizational structure of monitoring and inclusions

Person	Role
CME database administrator	The database administrator is responsible for updating and maintaining all electronic databases and inclusions. Required competencies include experience with data management systems (e.g. Excel, STATA, or SPSS), minimum 2 years working experience in a similar field, and at minimum a bachelor's degree from an institution of higher education.
Monitoring team	The monitoring team will be assigned by the CME to conduct the user interviews and appliance tests during the periodic sampling and reports the results to the database administrator. The skills and experience required for the data collection activities include: <ul style="list-style-type: none"> <li>▪ Experience conducting surveys/tests</li> <li>▪ Experience conducting door-to-door surveys of biomass consumption</li> <li>▪ Local language skills (especially important for input to questionnaire design and interviewing of end users)</li> <li>▪ English language skills</li> <li>▪ Cultural awareness</li> <li>▪ Numerical proficiency</li> <li>▪ Data entry skills</li> </ul>

## SECTION E. Data and parameters

### E.1. Data and parameters fixed ex ante

Data/Parameter	$B_{old}$
Unit	ton wood/ HH-year
Description	Quantity of woody biomass used in the absence of the project activity in tonnes per household
Source of data	Baseline for residential biomass stove users was determined through local survey conducted by a third party and commissioned for the purpose of this program activity. Details of the study were provided in CPA-DD 01 Appendix 3
Value(s) applied	For Residential: 4.97 tonnes wood-eq/HH-yr.

Choice of data or measurement methods and procedures	AMS-II.G. V5 allows for the use of historical data or survey of local usage to define relevant baseline appliance types as described in the baseline scenario. The CPAs utilize a survey of local usage to establish $B_{old}$ for the target user group "Residential" biomass stove users. Details of the measurement method and sampling approach are provided in CPA-DD Appendix 3.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	-

<b>Data/Parameter</b>	<b><math>\eta_{old}</math></b>
Unit	Percentage
Description	Efficiency of the system being replaced, measured using representative sampling methods or based on referenced literature values (percent)
Source of data	Efficiency of the systems replaced for residential biomass users was determined through local survey conducted by a third party and commissioned for the purpose of this program activity. Details of the study are provided in CPA-DD Appendix 3.
Value(s) applied	10%
Choice of data or measurement methods and procedures	Default value as provided in AMS-II.G. Version 5.0 (10%)
Purpose of data/parameter	Calculation of baseline emission
Additional comments	Applicable because CPA uses $\eta_{old}$ to determine $B_{y,savings}$ . During ICS dissemination, the type of baseline cookstove (traditional or improved) replaced is recorded and emission reductions is accounted only for the cases when ICS replaces traditional, unimproved cookstoves.

<b>Data/Parameter</b>	<b><math>L_y</math></b>
Unit	Percentage
Description	Leakage Factor is multiplied by a net to gross adjustment factor to account for leakages
Source of data	Default Value
Value(s) applied	95%
Choice of data or measurement methods and procedures	Default value deemed valid as per the CDM methodology. As per the methodology AMS II.G V5, a default value can be optionally used to account for leakages, in which case surveys are not required.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	None

<b>Data/Parameter</b>	<b><math>NCV_{biomass}</math></b>
Unit	TJ/tonne
Description	Net calorific value for biomass
Source of data	IPCC default value for wood fuel
Value(s) applied	0.015
Choice of data or measurement methods and procedures	Value of 0.015 TJ/tonne has been used as stipulated in AMS-II.G V5.  Reference: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2: <a href="http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html">http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html</a>
Purpose of data/parameter	Calculation of baseline emission
Additional comments	None

<b>Data/Parameter</b>	<b>EF<sub>projected_fossil_fuel</sub></b>
Unit	tCO <sub>2</sub> /TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers.
Source of data	Default value
Value(s) applied	81.60
Choice of data or measurement methods and procedures	Value of 81.6 tCO <sub>2</sub> /TJ has been used as stipulated in the methodology AMS-II.G V5.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	None

<b>Data/Parameter</b>	<b>f<sub>NRB,y</sub></b>
Unit	Percent
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
Source of data	Study
Value(s) applied	82%
Choice of data or measurement methods and procedures	The CDM Executive Board, at its sixty-seventh meeting, approved the approach to calculate the values of fraction of non-renewable biomass (f <sub>NRB</sub> ) for least developed countries (LDC) and small island developing states (SIDs) and Parties with 10 or less registered CDM project activities as of 31 December 2010. Default values are contained in annex 22, Table 2 of the meeting report
Purpose of data/parameter	Calculation of baseline emission
Additional comments	None

<b>Data/Parameter</b>	<b><math>\eta_{\text{specified}}</math></b>																				
Unit	Percentage																				
Description	Efficiency of the system being deployed at the time of CPA inclusion																				
Source of data	Manufactures specifications or independent testing																				
Value(s) applied	<table border="1"> <thead> <tr> <th>Stove Type</th><th>Thermal Efficiency</th></tr> </thead> <tbody> <tr> <td>EZY</td><td>23.39%</td></tr> <tr> <td>SHS</td><td>24.90%</td></tr> <tr> <td>AES</td><td>24.28%</td></tr> <tr> <td>SHS-GBE</td><td>30.00%</td></tr> <tr> <td>SHS-BOLD</td><td>37.30%</td></tr> <tr> <td>SHS-ILF</td><td>38.00%</td></tr> <tr> <td>Lugwana</td><td>35.00%</td></tr> <tr> <td>SpendSmart</td><td>36.30%</td></tr> <tr> <td>Energy Empire</td><td>33.00%</td></tr> </tbody> </table>	Stove Type	Thermal Efficiency	EZY	23.39%	SHS	24.90%	AES	24.28%	SHS-GBE	30.00%	SHS-BOLD	37.30%	SHS-ILF	38.00%	Lugwana	35.00%	SpendSmart	36.30%	Energy Empire	33.00%
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SHS-ILF	38.00%																				
Lugwana	35.00%																				
SpendSmart	36.30%																				
Energy Empire	33.00%																				
Choice of data or measurement methods and procedures	The thermal efficiency report provided by the manufacturer / certified by and ISO certified third party lab establishes the efficiency of ICS models																				
Purpose of data/parameter	Calculation of baseline emission																				
Additional comments	Note that $\eta_{\text{specified}}$ is the efficiency as per manufacturer specification for fulfilling eligibility criteria of the PoA. This value will not be used for ex-post calculation of emission reductions since $\eta_{\text{new}}$ is a monitored parameter to reflect possible changes in efficiency during the lifetime of the ICS.																				

## E.2. Data and parameters monitored

<b>Data/Parameter</b>	$\mu_{old}$
Unit	tonnes wood/ year
Description	Quantity of woody biomass used in the project activity by traditional stoves
Measured/calculated/default	Measured
Source of data	Monitoring survey records
Value(s) of monitored parameter	0.70
Monitoring equipment	--
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	The $\mu_{old}$ was calculated by asking end user no. of times per week, they used traditional stoves vs. number of times per week project stove is used during field survey by a dedicated team. All data is kept for 2 years following the crediting period or the last issuance of the CERs of the project activity.
QA/QC procedures	To conduct the survey, independent surveyor/third party was appointed; The survey results is stored in an electronic database and for a minimum of 2 years after the end of the crediting period of the CPA.
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	It is used to calculate $B_{y,saving}$

<b>Data/Parameter</b>	$\eta_{new}$																				
Unit	Percentage %																				
Description	Efficiency of the system being deployed as part of the project activity (percentage), as determined using the Water Boiling Test (WBT) protocol																				
Measured/calculated/default	Measured and calculated																				
Source of data	Water boiling test records																				
Value(s) of monitored parameter	<table border="1"> <thead> <tr> <th>Stove Model</th><th>Average Thermal Efficiency</th></tr> </thead> <tbody> <tr> <td>AES</td><td>23.98%</td></tr> <tr> <td>ENERGY EMPIRE</td><td>32.69%</td></tr> <tr> <td>EZY</td><td>23.18%</td></tr> <tr> <td>Lugwana</td><td>34.51%</td></tr> <tr> <td>SHS</td><td>23.63%</td></tr> <tr> <td>SHS-BOLD</td><td>36.99%</td></tr> <tr> <td>SHS-GBE</td><td>29.73%</td></tr> <tr> <td>SHS-ILF</td><td>37.32%</td></tr> <tr> <td>SpendSmart</td><td>36.04%</td></tr> </tbody> </table> <p>Weighted average efficiency considering stove deployment date is calculated as 26.36%. For detail refer "WBT Summary" Worksheet in ER calculator</p>	Stove Model	Average Thermal Efficiency	AES	23.98%	ENERGY EMPIRE	32.69%	EZY	23.18%	Lugwana	34.51%	SHS	23.63%	SHS-BOLD	36.99%	SHS-GBE	29.73%	SHS-ILF	37.32%	SpendSmart	36.04%
Stove Model	Average Thermal Efficiency																				
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SHS-BOLD	36.99%																				
SHS-GBE	29.73%																				
SHS-ILF	37.32%																				
SpendSmart	36.04%																				
Monitoring equipment	The tests were conducted following WBT protocol by trained field personnel by third party.																				
Measuring/reading/recording frequency	Annual																				
Calculation method (if applicable)	The WBTs were carried out in accordance with WBT protocol 4.2.3. A weighted average mean efficiency based on sales of each stove type is used across the CPAs.																				



QA/QC procedures	<p>The reliability calculation was conducted to ensure that the result obtained from the survey meets the precision required. The calculation and measurements are based on internationally accepted WBT protocol 4.2.3.</p> <p>The equipment used for WBTs were newly purchased at the time of monitoring to ensure that the measurements were done with the necessary guarantees. The results of the WBT are stored in an electronic database for a minimum of 2 years after the end of the crediting period of the CPA.</p>
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	-

<b>Data/Parameter</b>	<b>N<sub>y</sub></b>
Unit	Number of appliances
Description	Number of appliances deployed during period as part of the SSC-CPA
Measured/calculated/default	Measured
Source of data	Project Sales database
Value(s) of monitored parameter	Total ICS distributed= 135,050
Monitoring equipment	--
Measuring/reading/recording frequency	Continuously
Calculation method (if applicable)	Aggregated from Sales Records
QA/QC procedures	Each SSC-CPA partner organization maintains a project database of sales to calculate this parameter. CME's electronic records were cross-checked against a representative sample of paper and/or SMS records from distribution transactions made by the partner organizations.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	

<b>Data/Parameter</b>	<b>U<sub>y</sub></b>
Unit	%
Description	Average usage rate of appliance type being deployed during as part of the SSC-CPA.
Measured/calculated/default	Measured
Source of data	Usage Survey records
Value(s) of monitored parameter	85.90%
Monitoring equipment	--
Measuring/reading/recording frequency	Annual
Calculation method (if applicable)	Sampling Survey has been done to determine the number of appliances still in operation by field survey by a dedicated team. All data is kept for 2 years following the crediting period or the last issuance of the CERs of the project activity.
QA/QC procedures	The survey conducted by experienced team having prior experience of conducting surveys for various other carbon projects.
Purpose of data/parameter	Calculation of Baseline Emissions.
Additional comments	All data is transparent and verifiable.

### E.3. Implementation of sampling plan

>>

A single sampling plan was carried out across all specific-case CPAs covered in this monitoring report.

**a. List of CPAs to which the single sampling was applied**

CPA 9956P1—0001-CP1, 9956-P1-0002-CP1, 9956-P1-0003-CP1, 9956-P1-0004-CP1, 9956-P1-0005-CP1, 9956-P1-0006-CP1, 9956-P1-0007-CP1, 9956-P1-0008-CP1, 9956-P1-0009-CP1, 9956-P1-0010-CP1, 9956-P1-0011-CP1 and 9956-P1-0012-CP1 were covered in the single sampling plan.

**b. Description of implemented single sampling design**

i. Sampling Design

Due to the large number of ICS envisioned to be distributed as part of the CPAs to be included in the SSC-PoA, it is not economically feasible to monitor each individual ICS unit distributed. Therefore, representative sampling has been undertaken as part of a PoA-wide Sampling Plan (by grouping the CPAs' population). The Sampling is based on 95/10 confidence/precision.

ii. Objectives and Reliability Requirements

The objective was to obtain an unbiased and reliable estimate of the proportion or mean value of the following parameters over the course of the monitoring period, and with 95/10 confidence/precision for annual sampling across CPAs.

1. Thermal Efficiency of operational ICS:  $\eta_{new,y,i}$
2. Average usage rate of ICS:  $U_y$
3. Quantity of woody biomass used in the project activity by traditional stoves:  $\mu_{old}$

iii. Target Population

The target population for the three parameters stated above are all ICS recorded in the project database (135,050 units).

iv. Sampling Frame

For the parameters Stove Efficiency ( $\eta_{new,y,i}$ ) and Stove Usage rate ( $U_y$ ), the ICS population was stratified based on stove models (AES, EZY, SHS, SHS-GBE, SHS-BOLD, SHS-ILF, Lugwana, Energy Empire and SpendSmart). For monitoring the quantity of woody biomass used in the project activity by traditional stove ( $\mu_{old}$ ) the ICS were stratified based on the year of sale (2013-2018). The stratified sampling approach is in line with page 57 of the registered PoA-DD.

v. Sampling Method

The sampling was conducted using stratified random sampling technique over the aforesaid sampling frames created. The ICS population in each stratum was arranged by date of distribution, assigning them a sampling serial number. Random numbers were generated using the online random number generator ranging from 1 to total number of ICS in a given stratum and the samples corresponding to the random numbers obtained, were picked for sampling. This approach ensured that each ICS listed in the database had an equal chance of being selected. A slightly higher number of samples were picked than that needed to be monitored to cover for non-responses.

vi. Sampling Size

The required sample sizes were derived using equation (1), (2), (3), (4) and (9) of Appendix 3 of the Guideline: Sampling and surveys for CDM project activities and programmes of activities, Version 04.0 for monitoring parameter as follows:

$$n \geq \frac{z^2 * N * V}{(N-1) * precision^2 + z^2 * V}$$

Where,

n = number of ICS to be sampled

N = Total number of ICS in the population

z = Constant referring to level of confidence (1.96 for 95 % confidence)

Precision = Required precision (e.g. 10% = 0.1)

$$V = \frac{SD^2}{p}$$

Where (for proportion parameters):

$$SD^2 = \frac{\sum_{i=1}^k g_i * p_i * (1 - p_i)}{N}$$

$$\bar{p} = \frac{\sum_{i=1}^k g_i * p_i}{N}$$

Where,

g<sub>i</sub> = weight of strata i in the population

p<sub>i</sub> = expected proportion of strata i in the population

k = total number of strata in the population

and Where (for mean parameters):

$$SD^2 = \frac{\sum_{i=1}^k g_i * SD_i^2}{N}$$

$$Mean = \frac{\sum_{i=1}^k g_i * m_i}{N}$$

Where,

SD<sub>i</sub> = expected standard deviation of strata i in the population

m<sub>i</sub> = expected mean of strata i in the population

Stratified Random Sampling was applied by dividing the population into various strata. The expected parameter values were determined based on project developer's knowledge and experience as per para 12(b) and 12(c) of the "Standard: Sampling and surveys for CDM project activities and programmes of activities"

The CPA sub-group population was arranged chronologically for each stratum. The ICS were selected by randomly assigning, in corresponding stratum, a number to each stove and sorting in increasing order from lower to higher number. Random numbers were generated using online random number generator for each stratum and the numbers obtained were used to identify the samples from the stratum population. A slightly higher

number of samples were identified than that required to cover for outliers / non-response and ensure that the desired precision / confidence is achieved. The following tables demonstrate the same size determined:

Stove Efficiency $\eta_{new}$				
Stove Model (Sampling Frame)	Total Sales (Sampling Frame Size)	Expected Mean Efficiency(%)	Expected SD	Calculated Sample Size (n)
AES	7163	24	2.4	2
EZY	11299	23	2.3	2
SHS	45181	24	2.4	3
SHS-GBE	33420	30	3	2
SHS-ILF	8295	38	3.8	2
SHS-BOLD	6741	37.3	3.73	2
Lugwana	8563	35	3.5	2
Energy Empire	12163	33	3.3	2
SpendSmart	2225	36.3	3.63	2

Stove Operating Fraction $U_y$			
Stove Model (Sampling Frame)	Total Sales (Sampling Frame Size)	expected operational proportion (SoF)	Calculated Sample Size (n)
AES	7163	0.85	3
EZY	11299	0.85	4
SHS	45181	0.85	14
SHS-GBE	33420	0.95	11
SHS-ILF	8295	0.95	3
SHS-BOLD	6741	0.95	3
Lugwana	8563	0.95	3
ENERGY EMPIRE	12163	0.95	4
SpendSmart	2225	0.95	2

use of baseline stove per vintage				
Stove Model (Sampling Frame)	Total Sales (Sampling Frame Size)	Expected Mean value (kg per annum)	Expected SD	Calculated Sample Size (n)
2013	2447	1000	100	2
2014	8299	900	90	2
2015	18537	800	80	2
2016	13291	700	70	2
2017	36582	600	60	2
2018	55894	500	50	3

**c. Collected data (electronic spreadsheets may be attached and referenced)**

Data was collected using surveys / WBTs done by external third party, "Center for Integrated Research and Community Development Uganda (CIRCODU)". The data collected from the surveys were compiled into the Excel spreadsheet. In order to achieve the 95/10 reliability level for cross-CPA sampling few additional stoves were sampled from the database than that required to cover for non-responses, if any. As for the thermal efficiency of the stoves, water boiling tests were conducted using WBT protocol by PCIA as available on GACC website. The monitoring (surveys and WBTs) were conducted during August – December 2018.

**d. Analysis of the collected data**

Data obtained from the samples were used to estimate proportions and mean values for the parameters described above. The values were then being factored into the emissions reduction calculations.

Sampling Constants	Values
Monitoring period start	1-Nov-17
Monitoring period end	15-Aug-2018
Monitoring frequency (years)	1
Level of sampling	PoA

Confidence (%) (90 or 95)	95%
Margin of Error (%)	10%
Z value	1.96

Parameter	Result	Reliability / precision
$U_y$	85.90%	achieved
$\mu_{old}$	0.70 tonnes/year	achieved
$\eta_{new,y,i}$	28.34%	achieved

**e. 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

Stove Efficiency $\eta_{new}$				
Stove Model (Sampling Frame)	Total Sales (Sampling Frame Size)	Expected Mean Efficiency (%)	Expected SD	Calculated Sample Size (n)
AES	7163	24	2.4	2
EZY	11299	23	2.3	2
SHS	45181	24	2.4	3
SHS-GBE	33420	30	3	2
SHS-ILF	8295	38	3.8	2
SHS-BOLD	6741	37.3	3.73	2
Lugwana	8563	35	3.5	2
Energy Empire	12163	33	3.3	2
SpendSmart	2225	36.3	3.63	2
Sample size determination				
Estimated efficiency (mean)				28.64
Estimated Standard Deviation of efficiency (SD)				2.91
$V_{mean} = (SD/mean)^2$				0.01
Minimum Sample Size required (efficiency)				4
tDistribution sample size adjustment			Iteration 1	11
			Iteration 2	6
			Iteration 3	7
			Iteration 4	7
			Iteration 5	7
			Iteration 6	7
Monitoring Results				
Stove Model (Sampling Frame)	Sampling frame size	Monitored Sample Size	Monitored Efficiency (%)	Monitored Standard Deviation
AES	7163	4	23.98%	0.62%
EZY	11299	3	23.18%	0.29%
SHS	45181	5	23.63%	1.05%
SHS-GBE	33420	2	29.73%	0.17%
SHS-ILF	8295	2	37.32%	0.43%
SHS-BOLD	6741	2	36.99%	0.08%
Lugwana	8563	3	34.51%	0.32%
Energy Empire	12163	2	32.69%	0.14%
SpendSmart	2225	2	36.04%	0.19%
Reliability Check				
Samples Monitored				25
Mean Efficiency				28.34%
Standard error of mean				0.16%
Relative precision (Margin of error) (%)				0.49%
Result				Ok, acceptable
Lower Bound confidence value				not applicable

Stove Operating Fraction Uy			
Stove Model (Sampling Frame)	Total Sales (Sampling Frame Size)	expected operational proportion (SoF)	Calculated Sample Size (n)
AES	7163	0.85	3
EZY	11299	0.85	4
SHS	45181	0.85	14
SHS-GBE	33420	0.95	11
SHS-ILF	8295	0.95	3
SHS-BOLD	6741	0.95	3
Lugwana	8563	0.95	3
ENERGY EMPIRE	12163	0.95	4
SpendSmart	2225	0.95	2
Sample size determination			
Estimated SOF (p)			0.90
Estimated Standard Deviation of SOF (SD)			0.292
$V_{\text{SOF}} = (SD/p)^2$			0.10
Sample Size required (Uy)			41
Monitoring Results			
Stove Model (Sampling Frame)	Sampling frame size	Monitored Sample Size	Monitored Usage (%)
AES	7163	5	0.80
EZY	11299	11	0.73
SHS	45181	28	0.68
SHS-GBE	33420	13	1.00
SHS-ILF	8295	6	1.00
SHS-BOLD	6741	3	1.00
Lugwana	8563	4	1.00
Energy Empire	12163	6	1.00
SpendSmart	2225	3	1.00
Reliability Check			
Samples Monitored			79
Monitored Uy (p)			85.90%
Standard Error of Uy			3.30%
Relative precision (Margin of error)			0.19%
Result			Ok, acceptable
Lower Bound confidence value			not applicable

use of baseline stove per vintage				
Stove Model (Sampling Frame)	Total Sales (Sampling Frame Size)	Expected Mean value (kg per annum)	Expected SD	Calculated Sample Size (n)
2013	2447	1000	100	2
2014	8299	900	90	2
2015	18537	800	80	2
2016	13291	700	70	2
2017	36582	600	60	2
2018	55894	500	50	3
Sample size determination				
Estimated (p)				621.59
Estimated Standard Deviation (SD)				63.64
$V_{\text{mean}} = (SD/p)^2$				0.01
Minimum Sample Size required				5
Monitoring Results				
Stove Model (Sampling Frame)	Sampling frame size	Monitored Sample Size	Monitored Mean Value of use of baseline stove	Monitored Standard Deviation
2013	2447	2	3.73	0.00
2014	8299	3	2.61	1.07
2015	18537	5	2.20	1.04
2016	13291	2	1.86	0.88
2017	36582	4	0.99	1.02
2018	55894	9	2.09	0.88
Reliability Check				
Samples Monitored				25
Mean value				1.84
Standard error of mean				20.68%
Relative precision (Margin of error) (%)				9.59%
Result				ok acceptable
Applicable Value				0.70

#### f. Demonstration of whether the samples were randomly selected and are representative of the population

The samples were randomly selected using Stratified Random Sampling across the CPA population. Random numbers were generated using online random number generator for each stratum and the ICS corresponding to the random numbers obtained, were selected as samples to be monitored. Under Stratified Random Sampling, the entire target population has an equal chance of being selected, thus the samples selected were deemed to be representative of population.

### SECTION F. Calculation of emission reductions or net anthropogenic removals

#### F.1. Calculation of baseline emissions or baseline net removals

>>

Emission reductions are calculated as follows:

As per the SSC-PoA-DD, emission reductions for the SSC-CPA (Same for all 12 CPAs) has been calculated according to the following formula:

$$ER_y = (B_{y,\text{savings}} * N_y * U_y) * (f_{NRB,y} * NCV_{\text{biomass}} * EF_{\text{projected\_fossil fuel}}) \quad \text{Equation (1)}$$

Where:

$ER_y$	Emission reductions during the period y in tCO <sub>2</sub> e
$f_{NRB,y}$	Fraction of woody biomass saved by the project activity in period y that can be established as non-renewable biomass
$NCV_{\text{biomass}}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne)
$EF_{\text{projected\_fossil fuel}}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO <sub>2</sub> /TJ
$N_y$	Number of appliances of the type being deployed during period y as part of the SSC-CPA
$U_y$	Average usage rate (as opposite to drop-off) of appliances of type being deployed during period y as part of the SSC-CPA
$B_{y,\text{savings}}$	Quantity of woody biomass that is saved in tonnes per appliance.



$B_{y,savings,i}$  is estimated using option 2 of the methodology AMS II.G V5:

$$B_{y,savings} = [(B_{old} - \mu_{old}) * L] * (1 - \eta_{old}/\eta_{new}) \quad \text{Equation 2}$$

$B_{old}$  Quantity of biomass used in the absence of the project activity in tonnes/ year

$\mu_{old}$  Quantity of woody biomass for the continued use of old stoves

$\eta_{old}$  Weighted average value is used since the replaced systems are unimproved and improved baseline technologies.

$\eta_{new}$  The result obtained from independent testing is used. Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol. Use weighted average values if more than one type of system is being introduced by the project activity.

$L$  Leakage adjustment factor (fraction)

Description	Unit	9956-P1-0001-CP1	9956-P1-0002-CP1	9956-P1-0003-CP1	9956-P1-0004-CP1	9956-P1-0005-CP1	9956-P1-0006-CP1	9956-P1-0007-CP1	9956-P1-0008-CP1	9956-P1-0009-CP1	9956-P1-0010-CP1	9956-P1-0011-CP1	9956-P1-0012-CP1
Stove installed under CPA (Ny)	number	11299	13422	14632	13898	17000	17000	17000	17000	12551	542	482	224
Year equivalent fraction	fraction	0.789	0.789	0.789	0.789	0.788	0.590	0.355	0.190	0.043	0.000	0.000	0.000
$B_{old}$	tons wood-eq/HH-yr	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97
$\mu_{old}$	tonnes wood/ year	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
$\eta_{old}$	Percentage	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
$\eta_{new}$	Percentage	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
$B_{y,savings}$	Percentage	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%
$B_{y,savings}$	tons wood-eq/HH-yr	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52
$N_t$ (adjusted for year equivalent fraction)	Number	8915	10591	11545	10966	13399	10036	6042	3236	543	0	0	0
$\eta_{old}$	Percentage	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%
$\eta_{new}$	Percentage	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%
$HCV_{wood}$	TJ/tonne	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
$EF_{wood}$	tCO <sub>2</sub> /TJ	81.60	81.60	81.60	81.60	81.60	81.60	81.60	81.60	81.60	81.60	81.60	81.60
$ER_{wood}$	tCO <sub>2</sub>	19360	22997	25071	23813	29096	21793	13120	7027	1179	0	0	0
Annual thermal energy savings achieved by the CPA	GWh	101.86	121.00	131.91	125.29	153.25	153.25	153.25	153.25	113.15	0.00	0.00	0.00
Emission Reduction (ER)	tCO <sub>2</sub> e	19,360	22,997	25,071	23,813	29,096	21,793	13,120	7,027	1,179	-	-	-

## F.2. Calculation of project emissions or actual net removals

>>  
N/A

## F.3. Calculation of leakage emissions

>>  
N/A

## F.4. Calculation of emission reductions or net anthropogenic removals

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (t CO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2</sub> e)		
				Before 01/01/2013	From 01/01/2013	Total amount
9956-P1-0001-CP1	24,533	0	-	0	19,360	19,360
9956-P1-0002-CP1	29,143	0	-	0	22,997	22,997
9956-P1-0003-CP1	31,771	0	-	0	25,071	25,071
9956-P1-0004-CP1	30,177	0	-	0	23,813	23,813
9956-P1-0005-CP1	36,871	0	-	0	29,096	29,096
9956-P1-0006-CP1	27,617	0	-	0	21,793	21,793
9956-P1-0007-CP1	16,626	0	-	0	13,120	13,120
9956-P1-0008-CP1	8,905	0	-	0	7,027	7,027
9956-P1-0009-CP1	1,495	0	-	0	1,179	1,179
9956-P1-0010-CP1	0	0	-	0	0	0
9956-P1-0011-CP1	0	0	-	0	0	0
9956-P1-0012-CP1	0				0	0

Total	207,138	0	-	0	163,456	163,456
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### F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO <sub>2</sub> e)	Amount estimated ex ante (t CO <sub>2</sub> e)
9956-P1-0001-CP1	19,360	35,407
9956-P1-0002-CP1	22,997	35,491
9956-P1-0003-CP1	25,071	35,491
9956-P1-0004-CP1	23,813	35,491
9956-P1-0005-CP1	29,096	35,491
9956-P1-0006-CP1	21,793	35,491
9956-P1-0007-CP1	13,120	35,491
9956-P1-0008-CP1	7,027	35,491
9956-P1-0009-CP1	1,179	35,491
9956-P1-0010-CP1	0	35,491
9956-P1-0011-CP1	0	35,491
9956-P1-0012-CP1	0	35,491
<b>Total</b>	<b>163,456</b>	<b>425,809</b>

### F.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the CPA-DD”

&gt;&gt;

### F.6. Remarks on increase in achieved emission reductions

&gt;&gt;

The emission reductions achieved in the monitoring period are less than the values estimated in ex-ante calculation.

### F.7. Remarks on scale of small-scale CPAs

&gt;&gt;

The energy saving of each CPA is less than the methodology threshold i.e. 180 GWh<sub>th</sub>/year.

Description	Unit	9956-P1-0001-CP1	9956-P1-0002-CP1	9956-P1-0003-CP1	9956-P1-0004-CP1	9956-P1-0005-CP1	9956-P1-0006-CP1	9956-P1-0007-CP1	9956-P1-0008-CP1	9956-P1-0009-CP1	9956-P1-0010-CP1	9956-P1-0011-CP1	9956-P1-0012-CP1
Stove installed under CPA (N <sub>y</sub> )	number	11299	13422	14632	13898	17000	17000	17000	17000	12551	542	482	224
Year equivalent fraction	fraction	0.789	0.789	0.789	0.789	0.590	0.355	0.190	0.043	0.000	0.000	0.000	0.000
B <sub>add</sub>	tons wood-eq/HH	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97	4.97
B <sub>add</sub>	tonnes wood/ year	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
L <sub>y</sub>	Percentage	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%
Q <sub>add</sub>	Percentage	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Q <sub>draw</sub>	Percentage	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%	26.36%
B <sub>reducing</sub>	tons wood-eq/HH-yr	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52	2.52
N <sub>y</sub> (adjusted for year equivalent fraction)	Number	8915	10591	11545	10966	13399	10036	6042	3236	543	0	0	0
U <sub>y</sub>	Percentage	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%	85.90%
Emis <sub>y</sub>	Percentage	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%
NCV <sub>woodmass</sub>	TJ/tonne	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
EF <sub>woodmass, forest fuel</sub>	tCO <sub>2</sub> /TJ	81.60	81.60	81.60	81.60	81.60	81.60	81.60	81.60	81.60	81.60	81.60	81.60
ER <sub>y</sub>	tCO <sub>2</sub>	19360	22997	25071	23813	29096	21793	13120	7027	1179	0	0	0
Annual thermal energy savings achieved by the CPA	GWh <sub>th</sub>	101.86	121.00	131.91	125.29	153.25	153.25	153.25	153.25	113.15	0.00	0.00	0.00
Emission Reduction (ER)	tCO <sub>2</sub> e	19,360	22,997	25,071	23,813	29,096	21,793	13,120	7,027	1,179	-	-	-

## Appendix 1: Contact information (Additional)

Entity responsible for completing the CDM-PoA-MR-FORM	
Organization name	Climate-Secure Services
Street/P.O. Box	Club Road
Building	Pragati Apartments
City	West Delhi
State/Region	Delhi
Postcode	110063
Country	India
E-mail	<a href="mailto:info@climate-secure.com">info@climate-secure.com</a>
Website	<a href="http://www.climate-secure.com">www.climate-secure.com</a>
Contact Person	Rohit Lohia

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## Document information

Version	Date	Description
03.0	31 May 2019	Revision to: <ul style="list-style-type: none"> <li>Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN);</li> <li>Add a section on remarks on the observance of the scale limit of small-scale CPAs during the crediting periods;</li> <li>Add "changes specific to afforestation or reforestation activities/CPA" as a possible post-registration changes;</li> <li>Clarify the reporting of net anthropogenic GHG removals for A/R PoAs between two commitment periods;</li> <li>Make structural and editorial improvements.</li> </ul>
02.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>Ensure consistency with version 01.0 of the “CDM project standard for programmes of activities (CDM-EB93-A07-STAN);</li> <li>Make editorial improvements.</li> </ul>
01.0	1 April 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report, programme of activities		