



**Monitoring report form for CDM programme of activities  
(Version 02.0)**

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

**MONITORING REPORT**

<b>Title of the PoA</b>	Clean Energy Program Supported by Republic of Korea	
<b>UNFCCC reference number of the PoA</b>	10415	
<b>Version numbers of the PoA-DD applicable to this monitoring report</b>	2.0	
<b>Version number of this monitoring report</b>	2.1	
<b>Completion date of this monitoring report</b>	28/02/2019	
<b>Monitoring period number</b>	First monitoring period	
<b>Duration of this monitoring period</b>	28/08/2018 to 11/01/2019	
<b>Monitoring report number for this monitoring period</b>	1	
<b>Coordinating/managing entity</b>	ECO EYE Co., LTD	
<b>Host Parties</b>	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)
	Myanmar	Yes
<b>Sectoral scopes</b>	Sectoral scope 3 (Energy Demand)	
<b>Applied methodologies and standardized baselines</b>	AMS-II.G., version 08	
<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>	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	Not Applicable	148 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</b>	2993 tCO <sub>2</sub> e	

covered in this monitoring report

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

### SECTION A. Description of PoA

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

>>In Myanmar, commonly used fuel for cooking is fuelwood. As per *The 2014 Myanmar Population and Housing Census* report, as much as 86.2% of the rural households and 25.6% of the urban households use fuelwood for cooking<sup>1</sup>.

This high dependence on solid biomass degrades local environments; demands considerable time in fuel collection and creates indoor air pollution that causes respiratory diseases. Further, the burning of fuelwood adds significantly to GHG emissions. Both in rural and urban areas, millions of households depend upon fuelwood as their primary fuel for cooking.

##### (a) Policy/ measure or stated goal of the PoA

The objective of the *Clean Energy Program Supported by Republic of Korea* (hereafter referred to as “the program”) is to promote dissemination of fuelwood burning improved cookstoves (ICS). The implementation of projects under this program will improve access to clean energy, diminish demand for fuelwood, mitigate impact of climate change and contribute in socio-economic development of the beneficiary communities.

##### (b) Framework for the implementation of the proposed PoA

ECOEYE Co., LTD as a coordinating and managing entity (CME) will implement the CDM PoA-*Clean Energy Program Supported by Republic of Korea*. ECOEYE Co., LTD is a leading carbon offset project developer and trader that assist for-profit and not for profit organizations to implement climate mitigation projects. ECOEYE Co., Ltd. provides all implementation costs for the project under this CPA, including total operation & maintenance costs of ICS production and free distribution for CME and CPA implementers to operate the CPA(s) in a financially sustainable condition.

The program targets consumers that use fuelwood as their primary fuel for cooking to replace the existing technologies with ICS. The consumption of fuelwood degrades local environments creates indoor air pollution that causes respiratory diseases and adds significantly to GHGs emissions. The program by replacing inefficient technology/measure such as three stone stove, tripod and traditional cookstoves shall result in clean environment, reduction of GHG emissions and enhanced living standards in the user households.

#### 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
Title-Clean Energy Program Supported by Republic of Korea  Reference number-CPA MM [XX] Generic CPA MM 01	2.0	Sectoral scope 3 (Energy Demand)	AMS-II.G., version 08

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

Title and UNFCCC reference number of the CPA	Title and reference number of the corresponding generic	Version of the PoA-DD	Crediting period type and duration	Covered in this monitoring
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<sup>1</sup> The 2014 Myanmar Population and Housing Census Highlights of the Main Results Census Report Volume 2 – A, Pg 32 ([http://myanmar.unfpa.org/sites/asiapacific/files/pub-pdf/Census%20Highlights%20Report%20-%20ENGLISH%20\(1\).pdf](http://myanmar.unfpa.org/sites/asiapacific/files/pub-pdf/Census%20Highlights%20Report%20-%20ENGLISH%20(1).pdf))

	CPA			report? (yes/no)
Clean Energy Program Supported by Republic of Korea CPA MM 02 ;10415-0002	Title-Clean Energy Program Supported by Republic of Korea  Reference number-CPA MM [XX] Generic CPA MM 01	2.0	Fixed (10/01/2019 - 09/01/2029)	Yes
CPA MM 01; 10415-0001	Title-Clean Energy Program Supported by Republic of Korea  Reference number-CPA MM [XX] Generic CPA MM 01	2.0	Fixed (01/07/2018 - 30/06/2028)	No (Excluded on 03/01/2019)

## A.2. Coordinating/managing entity

&gt;&gt;

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Dusan-ro, Geumcheon-gu, Seoul. South Korea  
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Seoul Capital Area

Republic of Korea  
Office : +82- 2-6480-7346

## SECTION B. Implementation of PoA

### B.1. Description of implemented PoA

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The management system is designed as per the Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities, ver 04.0 paragraph 21.

#### a) A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies:

Entity	Role and Responsibility
ECOEYE Co., LTD	<p>As the CME, ECOEYE Co., LTD is responsible:</p> <ul style="list-style-type: none"> <li>•To sign agreements with CPA implementers;</li> <li>•To sign agreements with DOE for inclusion and verification services; To communicate with the CDMEB, including on matters related to the distribution of Certified Emission Reductions (CERs);</li> <li>•To review and assist in the selection and preparation of CPAs, ensuring that all CPAs fulfils eligibility criteria and neither registered as an individual CDM project activity nor included in another registered PoA ;</li> <li>•To ensure that ICS under the PoA meets minimum thermal efficiency requirement of twenty percent and satisfy the condition to qualify as a 'microscale CDM unit'<sup>2</sup>;</li> <li>•To ensure that the same approved baseline and monitoring methodology is applied to all the CPAs;</li> <li>•To establish CER ownership agreements with the CPA implementers;</li> <li>•To train and supervise CPA implementer in data collection and archiving;</li> <li>•To ensure that the CPA implementers maintain and provide monitoring data for calculating CERs;</li> </ul>

<sup>2</sup>Methodological tool Demonstration of additionality of microscale project activities Version 08.0. Paragraph 8 (c,i), 9 (b,i) and 10 (b,i)

	<ul style="list-style-type: none"> <li>•To plan and manage validation and verification process;</li> <li>•To establish and manage the data base for calculating CERs based on data received from the CPA implementers</li> </ul>
CPA implementers	<p>The role of CPA implementers is detailed below:</p> <ul style="list-style-type: none"> <li>•To disseminate ICS;</li> <li>•To institute adequate data collection and archiving systems;</li> <li>•To establish quality control procedures for all monitoring parameters;</li> <li>• To monitor and record the data</li> </ul>

**b)Records of arrangements for training and capacity development for personnel:**

The CME provides capacity building and training to CPA implementer's team to enhance:

- ICS marketing and distribution; and
- Data collection and archiving capability;
- The CME keeps records of capacity building and training activities.

**c)A procedure for technical review of inclusion of CPAs:**

- The CME collects all documents/information necessary to check compliance of CPA with the eligibility criteria of the PoA;
- Checking whether the CPA and included technology fulfils eligibility criteria of the PoA or not;
- The CME reviews monitoring plan of the CPA to ensure that it is in line with the monitoring plan mentioned in section B.7.2 of the PoA DD.

**d)A procedure to avoid double counting (e.g. to avoid the case of including a newCPA that has already been registered either as a CDM project activity or included as a CPA in another registered CDM PoA):**

- Every new CPA is compared to the already existing database and the list of similar project activities that are under validation or registered at the UNFCCC or any other mechanism to avail climate change mitigation benefits;
- CPA implementers in the PoA are made aware of the double counting principle i.e. CPA should neither a CDM project and/or as a part of any other CDM PoA and/or any other mechanism to avail climate change mitigation benefits;
- To avoid double counting of ICS, all ICS under the PoA bears the CME logo and 12 digit unique serial number. The unique serial number is a combination of numbers representing ICS's country of manufacturing, country of destination and manufacturing date. Unique serial number and user location details identify the project devices individually and separate it from other programs, if any in the present or in the future. The unique serial number can be verified with the product database. Each ICS distributed is entered into the PD with unique serial number and user details that clearly and unmistakably keep track of the ICS in each CPA. Therefore it is not possible for a particular ICS to be counted in two different CPAs.

## **B.2. Post-registration changes to PoA**

### **B.2.1. Corrections**

>>Corrections to the registered PoA-DD were approved on 17/12/2018(effective approval date) under reference number PRC-10415-001.

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

>>Not applicable.

### **B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools**

>>Corrections to the registered PoA-DD were approved on 17/12/2018(effective approval date) under reference number PRC-10415-001.

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

>>No change in the programme design.

**PART II        Monitoring of CPAs**

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

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The proposed Clean Energy Program Supported by Republic of Korea CPA MM 02 is a small scale type II project activity under “Clean Energy Program Supported by Republic of Korea” PoA. Purpose of the CPA is to disseminate fuelwood burning improved cookstoves [ICS] to households that are using fuelwood as a cooking fuel. ECOEYE Co., Ltd. provides all implementation costs for the project under this CPA with the total project cost per stove as USD 30, including total operation & maintenance costs of ICS production and free distribution for CME and CPA implementers to operate the CPA(s) in a financially sustainable condition.

**Technology**

This CPA includes distribution of ICS models S 26-13 and S 32-13. These are fuel efficient fuelwoodburning stoves. An ICS has enclosure for the fire to reduce the loss of radiant heat and protect it against the wind. It increases transfer of heat to the cooking pot by guiding upward flow of the fluegases. ICS burns fuel more cleanly and efficiently reducing fuel consumption and GHG emissions, easing pressure on forest resources and reducing indoor air pollution.

Technical description of the ICS under the CPA- S 26-13 and S 32-13 is given below:



Figure 1 ICS S 26-13

Figure 2 ICS S 32-13

Table 1: Technical Description of the ICS S 26-13 and S 32-13<sup>3</sup>

S.No	Parameter	S 26-13	S 32-13
1	Specific Fuel Consumption	0.035 MJ/min/L <sup>4</sup>	0.039 MJ/min/L <sup>5</sup>
2	Thermal Efficiency	28.9%	38.7%
3	Dimensions	325*270*268 mm	320*320*267 mm
4	Material	Stove body: 0.5mm stainless steel, Grade 201 Chamber: 1mm stainless steel, Grade 201 Stovetop: cast iron	Stove body: 0.5mm cold roll sheet Chamber: 1mm stainless steel, Grade 201 Stovetop: cast iron
5	Lifespan	5 years	5 years
6	Thermal Power	3.8 kW	4 kW

CPA title	CPA MM 02
CPA reference number	10415-0002
CPA crediting period start date	10/01/2019

<sup>3</sup>Manufacturer specification<sup>4</sup>S 26-13 WBT certificate<sup>5</sup>S 32-13 WBT certificate

## C.2. Location of CPAs

>>Physical/ Geographical boundary of the CPAsThe Republic of The Union of Myanmar, Latitude: 19° 04' 24.47" N

Longitude: 96° 40' 15.74" E

Source: <http://latitude.to/map/mm/myanmar>

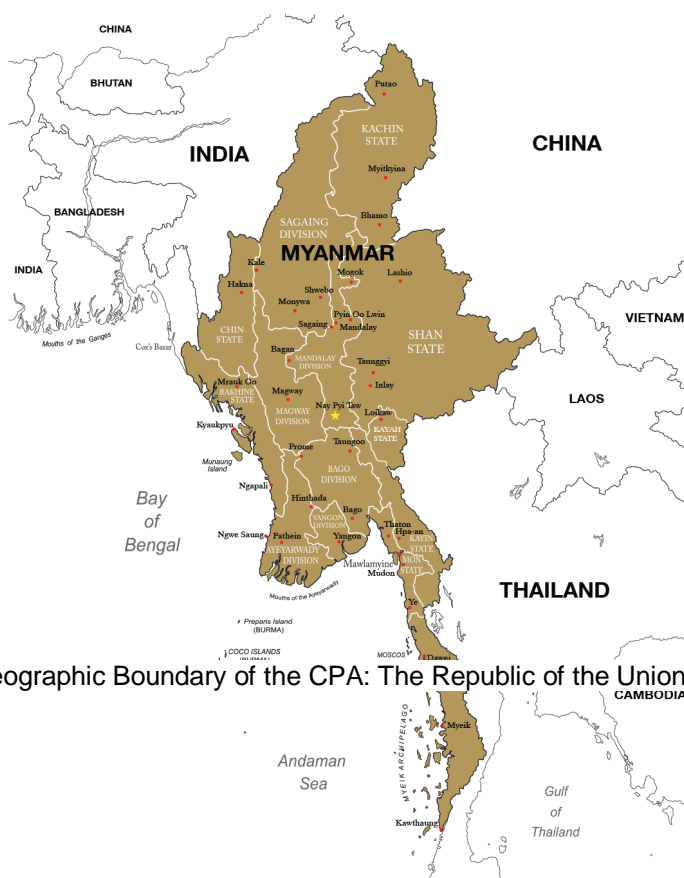


Figure 3 Geographic Boundary of the CPA: The Republic of the Union of Myanmar

## C.3. Post-registration changes toCPAs

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

>>Not applicable

### C.3.2. Corrections

>>Not applicable

### C.3.3. Changes to the startdate of the crediting period

>>Not applicable

### C.3.4. Inclusion of monitoring plan

>>Not applicable

### C.3.5. Permanent changesto the includedmonitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

>>Not applicable

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

&gt;&gt;Not applicable

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

The CME has trained field staff in project implementation, particularly in data collection and archiving. All ICS under the PoA bear the CME logo and 12 digit unique serial number. The unique serial number is a combination of numbers representing country of ICS manufacturing, country of destination and manufacturing date. Unique serial number and user location details identify the project devices individually and separate it from other programs, if any in the present or in the future. The unique serial number can be verified with the product database.

*Step 1: Data collection*

ICS were distributed in a social gathering organized in some village school or community hall. Relevant customer data such as name, address, signature, ICS type, unique serial number and distribution date were recorded by the field personnel using paper-based means.

*Step 2: Data Archiving*

The CME maintains a record keeping system- Project Database (PD). The total number of ICS by type and age group deployed during the crediting period can be tracked in the PD, which is updated regularly. All distributed ICS has been recorded for the distribution date and user details. The distribution date for each ICS listed in the PD signifies the start of operation. This information allows the CME/CPA implementers to track particular ICS and/or user.

**SECTION E. Data and parameters****E.1. Data and parameters fixed ex ante**

Data / Parameter	$f_{NRB}$
Unit	Fraction
Description	Fraction of woody biomass saved by the project activity during year $y$ that can be established as non-renewable biomass
Source of data	fNRB calculation sheet •SSC WG 35th meeting Report, Annex 20, Eq 3 •FAO Forest Resource Assessment (FRA) 2015 •2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 4, Table 4.9 • <a href="http://www.fao.org/docrep/004/Y1997E/y1997e21.htm">http://www.fao.org/docrep/004/Y1997E/y1997e21.htm</a>
Value(s) applied	0.8832



Choice of data or Measurement methods and procedures	<p><u>Choice of Data</u> Option A, paragraph 43 of the applied methodology AMS-II.Gver 08</p> <p><i>“To determine the value of the fraction of non-renewable biomass (fNRB) to be applied in a Component Project Activity (CPA) of a POA, use one of the two options as follows: (a) Conduct local studies to determine the local fNRB value (sub national values); or (b) Use default national values approved by the Board (see footnote 3). The choice of which option to use shall be made ex ante. However, a switch from a national value of fNRB (i.e. option (b)) to sub-national values (i.e. option (a)) is permitted, under the condition that the selected approach is consistently applied to all CPAs”</i></p> <p><u>Measurement methods and procedure</u> Measurement procedure is based on Equation 11 of the AMS-II.Gver 08 and approach mentioned in Annex 20 of the SSC WG 35<sup>th</sup> meeting report</p>
Purpose of data	Calculation of baseline emissions
Additional comments	Parameter is fixed ex ante at CPA level

<b>Data / Parameter</b>	<b>NCV<sub>biomass</sub></b>
Unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass, briquettes or charcoal used in project devices.
Source of data	AMS-II.Gver 08- Pg 17. Data/parameter table 12
Value(s) applied	0.015
Choice of data or Measurement methods and procedures	IPCC default for wood fuel, 0.015 TJ/tonne, based on the gross weight of the wood that is 'air-dried' may be used if fuel used in project device is also woody biomass
Purpose of data	Calculation of baseline emissions
Additional comments	Fixed ex ante at PoA level

<b>Data / Parameter</b>	<b><math>\eta_{old}</math></b>
Unit	Fraction
Description	Efficiency of pre - project device, which is a three stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be optionally used. Weighted average values will be used (taking the amount of woody biomass consumed by each device as the weighting factor) if more than one type of device is being replaced
Source of data	AMS.II-G ver 08.0. Data/parameter table 17
Value(s) applied	0.1
Choice of data or Measurement methods and procedures	Default value suggested in AMS.II-G ver 08.0

Purpose of data	Calculation of baseline emissions
Additional comments	The parameter value is fixed ex ante at CPA level.

<b>Data / Parameter</b>	<b><i>EF<sub>projected fossilfuel</sub></i></b>
Unit	tCO <sub>2</sub> e/t
Description	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers
Source of data	AMS-II.G ver 08- page 5
Value(s) applied	81.6
Choice of data or Measurement methods and procedures	Default value suggested in AMS.II-G ver 08.0
Purpose of data	Calculation of baseline emissions
Additional comments	The parameter value is fixed ex ante at PoA level

<b>Data / Parameter</b>	<b><i>LF<sub>y</sub></i></b>
Unit	Fraction
Description	Leakage adjustment factor
Source of data	AMS II.G version 08. Para 42 c
Value(s) applied	0.95
Choice of data or Measurement methods and procedures	As per the methodology AMS II.G ver 08.0:  Gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required
Purpose of data	Calculation of leakage emissions
Additional comments	The parameter value is fixed ex ante at PoA level

<b>Data / Parameter</b>	<b>Life Span</b>
Unit	Number of years
Description	Operating life time of S 26-13 and S 32-13
Source of data	Manufacturer specification
Value(s) applied	5
Choice of data or Measurement methods and procedures	Fixed and recorded at the time of commissioning/distribution
Purpose of data	Calculation of baseline emissions
Additional comments	Project devices will be removed after completing life span and no emission reductions will be claimed

<b>Data / Parameter</b>	<b><i>B<sub>old,HH</sub></i></b>
Unit	tonnes/household/year

Description	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	UN Database ( <a href="http://data.un.org/Data.aspx?d=EDATA&amp;f=cmID%3AFW%3BtrID%3A1231">http://data.un.org/Data.aspx?d=EDATA&amp;f=cmID%3AFW%3BtrID%3A1231</a> ) year 2016  The 2014 Myanmar Population and Housing Census The Union Report Census Report Volume 2, 2015 Table 13 ( <a href="https://myanmar.unfpa.org/en/publications/union-report-volume-2-main-census-report">https://myanmar.unfpa.org/en/publications/union-report-volume-2-main-census-report</a> )
Value(s) applied	4.18
Choice of data or Measurement methods and procedures	Historical data
Purpose of data	Calculation of baseline emissions
Any comments	Decided at CPA level

<b>Data / Parameter</b>	<b><math>B_{old,ij}</math></b>
Unit	tonnes/year
Description	Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type $i$ and batch $j$
Source of data	Calculated parameter to be fixed ex-ante
Values applied	4.18
Measurement procedures (if any)	AMS.II-G ver 08.0 Equation 9 $B_{old,HH}$ divided by $N_{d,HH}$ (number of project device/household)
Purpose of data	Calculation of baseline emissions
Any comments	CME has distributed only one improved stove per household. Therefore $N_{d,HH}$ is equal to one and $B_{old,ij}$ equals $B_{old,HH}$

## E.2. Data and parameters monitored

<b>Data/Parameter</b>	<b><math>N_{y,ij}</math></b>
Unit	Number of units
Description	Number of project devices of type $i$ and batch $j$ operating during year $y$
Measured/calculated/default	Calculated
Source of data	Project database and monitoring survey

Value(s) of monitored parameter	ICS Type		Units
	S 26-13		3,484
	S 32-13		7,217
Monitoring equipment	Not Applicable		
Measuring/reading/recording frequency	At least once in every two years (biennial)		
Calculation method (if applicable)	<p>All distributed ICS were recorded in the project database for distribution date and recipient's location. The total number of ICS by type and age group deployed during selected monitoring period can be tracked in the project database of the CPA.</p> <p>The number of ICS operating under the CPA was determined by conducting a sampling survey. The exact number of ICS operating under the CPA is based on fraction of ICS of type (S 32-13 and S 26-13) and age group (1-365 days) found operational in the sampling survey multiplied by total number of ICS of type (S 32-13 and S 26-13) and age group (1-365 days) in the project database.</p> <p>Sampling survey was carried out according to the sampling plan mentioned in section B.7.2 of the PoA-DD</p>		
QA/QC procedures	A 95 per cent confidence interval and a 10 per cent margin has been applied for the sampling parameter		
Purpose of data/parameter	Calculation of baseline emissions		
Additional comments	<p>During the ex-post monitoring survey presence of additional ICS was cross-checked on sampling basis and total ICS population has been discounted by the fraction of sampled household found using more than one project ICS.</p> <p>Electronic copy of data sources will be archived for two years</p>		

Data / Parameter	$\eta_{new,ij}$
Unit	Fraction
Description	Efficiency of the project device of each type <i>i</i> and batch <i>j</i>
Measured/calculated/default	Calculated
Source of data	Water Boiling Test Results
Value(s) applied	$\eta_{S26-13}$ - 0.2863 $\eta_{S32-13}$ - 0.3805

Monitoring equipment	Equipment	Accuracy	Calibration Date
	Electronic weighing machine	1 gram	18/01/2019
	Digital Thermometer	0.1 C	18/01/2019
	Digital Moisture meter	0.1%	18/01/2019
Measuring/reading/recording frequency	Once in a year		
Calculation method (if applicable)	A WBT was conducted on six ICS (3 S26-13+ 3 S32-13), with three tests conducted for each ICS therefore total nine tests were conducted. The standard deviation of the nine test results indicated above is very small (S 26-13 is 2.01% and S 32-13 is 2.23%) and 90/10 precision requirement is met		
QA/QC procedures	Based on WBT protocol 4.2.3		
Purpose of data	Calculation of baseline emissions		
Additional comments	For the subsequent monitorings of the same CPA, the previously monitored value of thermal efficiency shall be used for ex-ante purposes. If thermal efficiency of the project devices falls below 20 percent no emission reductions will be claimed		

Data / Parameter	Date of commissioning of project device <i>i</i>
Unit	Date
Description	Actual date of commissioning of the project device <i>i</i>
Measured/calculated/default	Measured
Source of data	Project database

Value(s) applied	Refer project database
Monitoring equipment	Not applicable
Measuring/reading/recording frequency	Recorded at the time of distribution of project devices
Calculation method (if applicable)	Each sale/distribution was recorded in project database along with the ICS type, name of recipient, contact details, location of household (village, district etc)
QA/QC procedures	Not applicable
Purpose of data	Calculation of baseline emissions
Additional comments	Electronic copy of record will be archived for 2 years

<b>Data / Parameter</b>	$\mu_y$						
Unit	Fraction						
Description	Adjustment to account for any continued use of pre-project devices during the year $y$						
Measured/calculated/default	Calculated						
Source of data	Monitoring survey						
Values applied	<table border="1"> <tr> <td>ICS Type</td><td>Usage rate</td></tr> <tr> <td>S 26-13</td><td>0.8224</td></tr> <tr> <td>S 32-13</td><td>0.8588</td></tr> </table>	ICS Type	Usage rate	S 26-13	0.8224	S 32-13	0.8588
ICS Type	Usage rate						
S 26-13	0.8224						
S 32-13	0.8588						
Monitoring equipment	Not applicable						
Measuring/reading/recording frequency	At least once in every two years (biennial)						
Calculation method (if applicable)	Household survey was conducted. The survey captured the cooking habits and ICS usage of households in the project area, including quantification of use of baseline devices, by formulating questions to determine the frequency of usage of both, the project devices and baseline devices. Sampling survey was carried out according to the sampling plan mentioned in section B.7.2 of the PoA-DD						
QA/QC procedures	A 95 per cent confidence interval and a 10 per cent margin of error has been selected						
Purpose of data	Calculation of baseline emissions						
Additional comments	All data sources will be archived for two years						

<b>Data / Parameter</b>	$N_{d,HH}$
Unit	Number

Description	Number of project devices distributed per household								
Measured/calculated/default	Measured								
Source of data	Project database								
Value(s) applied	<table><tr><td>ICS Type</td><td><math>N_{d,HH}</math></td></tr><tr><td>S 26-13</td><td>1</td></tr><tr><td>S 32-13</td><td>1</td></tr></table>			ICS Type	$N_{d,HH}$	S 26-13	1	S 32-13	1
ICS Type	$N_{d,HH}$								
S 26-13	1								
S 32-13	1								
Monitoring equipment	Not applicable								
Measuring/reading/recording frequency	Recorded at the time of distribution of project devices								
Calculation method (if applicable)	Recorded at the time of distribution of project devices and it was crosschecked with user details having number of ICS								
QA/QC procedures	CME has distributed only one improved stove per household. Therefore $N_{d,HH}$ is equal to one. Project database was checked and if it was found that none of the household has received more than one ICS.								
Purpose of data	Calculation of baseline emissions								
Additional comments	All data sources will be archived for two years								

### E.3. Implementation of sampling plan

>>

As of now only one CPA i.e. CPA MM 02 is active under the PoA. The number of ICS distributed under the CPA are as follows:

CPA	ICS Type	Number of Units	CPA Monitoring Period
CPA MM 02	S 26-13	3,566	10/01/2019 to 11/01/2019
	S 32-13	7,492	

#### Sampling Plan

The CPA involves distribution of ICS throughout the project area thereby replacing traditional cookstoves. The population is heterogeneous in nature i.e. common technology with similar operating characteristics but dispersed i.e. distribution of ICS is spread across many provinces. The population consists of sub-populations which are homogeneous called as Strata. The characteristics of population (for example quantity of biomass consumed) are more similar within the stratum (ICS of same type, age group and provinces in which they are operating) than across the strata. Therefore, Stratified Sampling technique was adopted to conduct sampling survey.

To ensure representativeness of the population, dissimilarity (such as ICS type, age group and provinces in which they are operating) within the included CPA has been taken into account in the sample size calculation. The ICS of same type, age group and province in which they are operating were grouped in the same strata.

#### (a) Procedure of Stratified Sampling

In stratified sampling, the population elements i.e. ICS shall be grouped into mutually exclusive, non-overlapping groups of sample units called strata. Every ICS can be assigned to only one stratum in such a way that no ICS will be excluded.

- 1) Segregating total number of ICS operating under the CPA into sub-groups or strata based on ICS type, age group and province where they are located;

- 2) Calculating total sample size and then sample size for each strata;
- 3) Drawing sample from each stratum according to the sample size through simple random sampling method using random number generator.

*(b) Target population*

The target population includes all ICS using Households (HHs) of Ayeyarwaddy region in the project database (PD), which are end-users of the project technology. This represented total 11,058 (3,566 S 26-13 and 7,492 S 32-13) ICS HHs in Ayeyarwaddy region.

*(c) Sample Frame*

Total number of ICS operating under the PoA were separated into sub-groups or strata based on ICS type (S 26-13 and S 32-13), age group (1 to 365 days) and province (Ayeyarwaddy) where they are located:

Table 2: Sample Frame

Particular	PoA	CPA MM 02	
Number of ICS operating	11,058	11,058	
Province/State	1	Ayeyarwaddy	
ICS Type	Type	S 26-13	S 32-13
	Quantity	3,566	7,492
ICS Age Group	Age Group	1 <sub>a</sub> (1-365 days)	1 <sub>b</sub> (1-365 days)
	Quantity	3,566	7,492
Strata	2	1	1
		Sample Frame	

*(d) Sample Selection*

A stratified sampling method has been used to select the sample for PS. Excel's built-in random number generator was used to generate random numbers. Sample size was calculated as per the formula described in the registered PoA DD. The expected values of parameters (mean, standard deviation and proportion) have been determined by using the CME's knowledge and experience<sup>6</sup>.

Sample size for ICS S 26-13 (population 3,566)

Parameter	Data Type	Expected Results	Precision Level		Sample Size		Actual Results	Precision Level	
			Confidence Interval	Marginal Error	Calculated	Oversample <sup>7</sup>		Confidence Interval	Marginal Error
$N_{y,i,j}$	Proportion	0.80	95 %	10 %	31	45 <sup>8</sup>	0.977	95 %	2.7%
$\mu_y$	Mean	0.75 (Mean), 0.4 (SD)	95 %	10 %	(36), 45 <sup>9</sup>	45	0.8588 (Mean), 0.2999 (SD)	95 %	6.8%

<sup>6</sup>Sampling and surveys for CDM project activities and programmes of activities, version 07.0, para 12 (b) and 12 (c)

<sup>7</sup>It is a good practice to employ **oversampling** at the design stage, not only to compensate for any attrition, outliers or non-response associated with the sample, but also to prevent a situation at the analysis stage where the required reliability is not achieved and additional sampling efforts would be required. This would then be expensive, time-consuming and inconvenient.

<sup>8</sup>If there is more than one parameter to be estimated in a CDM project activity, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen for the sampling effort with one common survey, or the sampling effort and survey is repeated for each of the parameters. (Standard- Sampling and surveys for CDM project activities and programmes of activities Version 07.0).

<sup>9</sup>If there is more than one parameter to be estimated in a CDM project activity, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen for the sampling effort with one common survey, or the sampling effort and survey is repeated for each of the parameters. (Standard- Sampling and surveys for CDM project activities and programmes of activities Version 07.0).



$\eta_{new,i,j}$ S26-13	Mean	~28.9	As per registered CPA DD page 22 and 23	ICS	Test/ICS	Total Test	No over sampling	28.63	90%	3.85 %
				3	3	9				

Sample size for ICS S 32-13 (population 7,492)

Sample Size for 95 % Confidence Level (Population = 1,027)											
Parameter	Data Type	Expected Results	Precision Level		Sample Size			Actual Results	Precision Level		
			Confidence Interval	Margin of Error	Calculated		Oversample <sup>10</sup>		Confidence Interval	Margin of Error	
$N_{y,i,j}$	Proportion	0.80	95 %	10 %	66		85 <sup>11</sup>	0.963	95 %	2.7%	
$\mu_y$	Mean	0.75 (Mean), 0.4 (SD)	95 %	10 %	(74), 85 <sup>12</sup>		85	0.8224 (Mean), 0.334 (SD)	95 %	6.8%	
$\eta_{new,i,j}$ S32-13	Mean	~38.7	As per registered CPA DD page 22 and 23		ICS	Test/ICS	Total Test	No over sampling	38.05	90%	3.21 %
					3	3	9				

#### (e) Survey

Data for  $N_{y,i,j}$  and  $\mu_y$  was collected through questionnaire form method and for  $\eta_{new,i,j}$  by conducting WBT. On site survey was conducted to determine  $N_{y,i,j}$ ,  $\mu_y$  by checking usage of ICS by the households. End user were interviewed to verify that ICS is still in use or not.

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

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

>>

As per applicable methodology, AMS-II.G. version 08.0 ; formula to calculate emission reductions (ERs) is:

$$ER_y = \sum_i \sum_j ER_{y,i,j} - LE_y \quad \text{Equation (1)}$$

Where

$i$  = Indices for the situation where more than one type of project device is introduced to replace the pre-project devices<sup>13</sup>

<sup>10</sup>It is a good practice to employ **oversampling** at the design stage, not only to compensate for any attrition, outliers or non-response associated with the sample, but also to prevent a situation at the analysis stage where the required reliability is not achieved and additional sampling efforts would be required. This would then be expensive, time-consuming and inconvenient.

<sup>11</sup>If there is more than one parameter to be estimated in a CDM project activity, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen for the sampling effort with one common survey, or the sampling effort and survey is repeated for each of the parameters. (Standard- Sampling and surveys for CDM project activities and programmes of activities Version 07.0).

<sup>12</sup>If there is more than one parameter to be estimated in a CDM project activity, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen for the sampling effort with one common survey, or the sampling effort and survey is repeated for each of the parameters. (Standard- Sampling and surveys for CDM project activities and programmes of activities Version 07.0).

<sup>13</sup> For example, in some instances, full replacement of the pre-project device would require the implementation of more than one project device (e.g. one stove suitable for cooking and the other stove suitable for cooking/boiling water)

$j$	= Indices for the situation where there is more than one batch of project device
$ER_y$	= Emission reductions during year $y$ in t CO <sub>2</sub> e
$ER_{y,i,j}$	= Emission reductions by project device of type $i$ and batch $j$ during year $y$ in t CO <sub>2</sub> e
$LE_y$	= Leakage emissions in the year $y$

Where

Equation (2)

$$ER_{y,i,j} = B_{y,savings,i,j} \times N_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\ fuel}$$

Where

$B_{y,savings,i,j}$	= Quantity of woody biomass that is saved in tonnes per cook stove device of type $i$ and batch $j$ during year $y$
$f_{NRB,y}$	= Fraction of woody biomass that can be established as non-renewable biomass using survey methods or government data or default country specific fraction of non-renewable woody biomass ( $f_{NRB}$ ) values available on the CDM website
$NCV_{biomass}$	= Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
$EF_{projected\_fossil\ fuel}$	= Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 t CO <sub>2</sub> /TJ <sup>14</sup>
$N_{y,i,j}$	= Number of project devices of type $i$ and batch $j$ operating during year $y$
$\mu_y$	= Adjustment to account for any continued use of pre-project devices during the year $y$ when applying equations 6 and 8 (fraction). Use 1.0 in other cases

To calculate  $B_{y,savings,i,j}$  CPAs will use equation 6 of option 3 of the AMS-II.Gver 08

$$B_{y,savings,i,j} = B_{old,i,j} \times \left(1 - \frac{\eta_{old,i,j}}{\eta_{new,i,j}}\right) \quad \text{Equation (6)}$$

Where

$B_{old,i,j}$	= Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type $i$ and batch $j$
$B_{y=1,new,i,j,survey}$	= Quantity of woody biomass used by project devices in tonnes per device of type $i$ and batch $j$
$\eta_{new,i,j}$	= Efficiency of the device of each type $i$ and batch $j$ implemented as part of the project activity

(f)

<sup>14</sup> This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. It is assumed that the mix of present and future fuels used would consist of a solid fossil fuel (lowest in the ladder of fuel choices), a liquid fossil fuel (represents a progression over solid fuel in the ladder of fuel use choices) and a gaseous fuel (represents a progression over liquid fuel in the ladder of fuel use choices). Thus a 50 per cent weight is assigned to coal as the alternative solid fossil fuel (96 t CO<sub>2</sub>/TJ) and a 25 per cent weight is assigned to both liquid and gaseous fuels (71.5 t CO<sub>2</sub>/TJ for kerosene and 63.0 t CO<sub>2</sub>/TJ for liquefied petroleum gas (LPG))

$\eta_{old,i,j}$  = Efficiency of pre - project device, which is a three stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney;

$$B_{old,i,j} = (B_{old,HH}/N_{d,HH}) \quad \text{Equation (9)}$$

Where

$B_{old,HH}$  = Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices

$N_{d,HH}$  = Number of project device per household

S No	Description	Parameter	Unit	Value	Comment
1	Efficiency of pre - project device, which is a three stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney;	$\eta_{old,i,j}$	Fraction	0.10	Default value fixed ex ante at CPA level
2	Efficiency of the device of each type $i$ and batch $j$ implemented as part of the project activity.	$\eta_{new,i,j,S26-13}$	Fraction	0.2863	Monitored at CPA level
		$\eta_{new,i,j,S32-13}$		0.3805	
3	Quantity of woody biomass that is saved in tonnes per cook stove device of type $i$ and batch $j$ during year $y$	$B_{y,savings,i,j,26-13}$	tonnes/yr	2.721	Calculated
		$B_{y,savings,i,j,32-13}$		3.085	
4	Adjustment to account for any continued use of pre-project devices during the year $y$ when applying equations 6 and 8 (fraction). Use 1.0 in other cases	$\mu_{y,26-13}$	Fraction	0.8588	Monitored at CPA level
		$\mu_{y,32-13}$		0.8224	
5	Fraction of non-renewable biomass	$f_{NRB}$	Fraction	0.8832	Fixed ex ante at CPA level
6	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, based on the gross weight of the wood that is 'air-dried')	$NCV_{biomass}$	TJ/tonne	0.015	Default value fixed ex ante at PoA level
7	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 t CO <sub>2</sub> /TJ	$EF_{projected\_fossilfuel}$	tCO <sub>2</sub> e/t	81.6	Default value fixed ex ante at PoA level
8	Leakage Factor	$LF$	Factor	Net to gross adjustment factor of 0.95. Fixed Ex ante at PoA level	Net to gross adjustment factor of 0.95. Fixed Ex ante at PoA level

9	Number of project devices of type $i$ and batch $j$ operating during year $y$	$N_{y,i,j26-13}$	Number	3484	Calculated
		$N_{y,i,j32-13}$		7217	
10	Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type $i$ and batch $j$	$B_{old,i,j}$	tonnes/hh/yr	4.18	Calculated at CPA level
11	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices	$B_{old,HH}$	tonnes/hh/yr	4.18	Historical data. Fixed Ex ante at PoA level
12	Number of project device per household	$N_{d,HH}$	Number	1	Monitored at CPA level
13	Leakage emissions per ICS in the year $y$	$LE_{ij,S26-13}$	tCO <sub>2</sub> e	0.126	Calculated
		$LE_{j,S32-13}$		0.137	
14	Emission reductions by project device of type $i$ during year $y$ in t CO <sub>2</sub> e	$ER_{ij,S26-13}$	tCO <sub>2</sub> e	2.40	Calculated
		$ER_{j,S32-13}$		2.605	
15	Number of project device operating under the CPA	$N_{ij,S26-13}$	Number	3,484	Calculated
		$N_{j,S32-13}$		7,217	
16	Emission reductions by project device of type $i$ during the monitoring period in t CO <sub>2</sub> e	$ER_{ij,S26-13}$	tCO <sub>2</sub> e	45.82	Calculated
		$ER_{j,S32-13}$		103.03	
17	Emission reductions during the monitoring period in t CO <sub>2</sub> e	ER	tCO <sub>2</sub> e	148	Calculated

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

>>Not applicable.

## F.3. Calculation of leakage emissions

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### Leakage

AMS.II.G., version 08.0 suggests two sources of leakage:

a) Leakage related to the non-renewable woody biomass saved by the project activity. This was assessed by the following method:

$B_{y,savings,i,j}$  is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

$$LE_{y,26-13} = B_{y,savings,i,j,26-13} \times N_{y,i,j,26-13} \times \mu_{y,26-13} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\ fuel} * (1 - 0.95)$$

$$LE_{y,26-13} = 2.41 \text{ tCO}_2\text{e}$$

$$LE_{y,32-13} = B_{y,savings,i,j,32-13} \times N_{y,i,j,32-13} \times \mu_{y,32-13} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\ fuel} * (1 - 0.95)$$

$$LE_{y,32-13} = 5.42 \text{ tCO}_2\text{e}$$

b) If devices currently being utilised outside the project boundary are transferred to the project activity, then leakage is to be considered.

No transfer of project devices from outside to the project activity area, hence this type leakage was not considered.

**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
10415-0002	156.68	0	7.83	0	148	148
<b>Total</b>	156.68	0	7.83	0	148	148

**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 (tCO <sub>2</sub> e)	Amount estimated ex ante (tCO <sub>2</sub> e)
10415-0002	148	2993
<b>Total</b>	148	2993

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

>>During this monitoring period there is a slight increase in the GHG emission reductions achieved by the CPA due to higher ICS usage rate.

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**Document information**

Version	Date	Description
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.
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