**Verification and certification report form for CDM programme of activities**

**(version 01.0)**

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

| VERIFICATION AND CERTIFICATION REPORT | | |
|---|---|---|
| **Title of the programme of activities (PoA)** | African Improved Cooking Stoves Programme of Activities | |
| **UNFCCC reference number of the PoA** | 5342 | |
| **Version number(s) of the PoA-DD(s) applicable to this report** | Version 4.3, dated 07/06/2014 | |
| **Version number of the verification and certification report** | 1.1 | |
| **Completion date of the verification and certification report** | 27/01/2017 | |
| **Monitoring period number** | 03 | |
| **Duration of this monitoring period** | 25/10/2014 - 24/10/2015 (inclusive of both days) | |
| **Number and version number of the monitoring report to which this report applies** | Number - 2.0, version number of monitoring report – 2.2 | |
| **Coordinating/managing entity (CME)** | Envirofit International Ltd. | |
| **Host Party(ies)** | Host Party(ies) of the PoA | Is this a host Party to a CPA covered in this report?(yes/no) |
| | Ghana | No |
| | Nigeria | Yes |
| | Liberia | No |
| **Sectoral scope(s)** | Sectoral scope: 3: Energy demand | |
| **Selected methodology(ies)** | AMS-II.G Ver 3.0: Energy efficiency measures in thermal applications of non-renewable biomass | |
| **Selected standardized baseline(s)** | Not applicable | |
| **Total estimated GHG emission reductions or net GHG removals for this monitoring period in the included CPA(s) covered in this report** | 88,318 $tCO_2e$ | |
| **Total certified GHG emission reductions or net GHG removals for this monitoring period for the included CPA(s) covered in this report** | 20,040 $tCO_2e$ | |
| **Name of DOE** | Earthood Services Private Limited | |

| | |
|---|---|
| **Name, position and signature of the approver of the verification and certification report** |  <br>Dr. Kaviraj Singh<br>Managing Director |

## SECTION A. Executive summary

>> The PoA under verification involves distribution of improved cook stoves (ICS) in the regions of Ghana, Nigeria and Liberia. The ICS are biomass based which replace the wood fuel/charcoal based traditional stoves. The ICS distributed under the programme are more efficient in transferring heat from the fuel to the pot when compared to the stoves typically being used in the baseline.

The distribution is taken care of by Envirofit International Ltd (Envirofit) which is the CME of the PoA as well as Distribution Organisation (DO) for implementation of the CPAs.

The areas (majorly rural and semi-urban) where the PoA implementation has taken place uses the inefficient traditional stoves (three-stone fired and equivalent). It has been replaced with the efficient improved cook stoves (ICS) which combust the fuel (wood and charcoal) far more efficiently resulting in generation of much lesser GHG and particulate matter. Additionally, it enhances the flow of thermal energy to cooking pots reducing the fuel usage and thus reduces GHG emissions and improves livelihood prospects due to reduced expenses on fuel. These effects further results into improvised health of women and children in the household.

PoA under verification has 6 CPAs; 5342-0001, 5342-0002, 5342-0003, 5342-0004, 5342-0005 and 5342-0006. However, this request of issuance has been submitted only for two CPAs in Nigeria viz 5342-0004 and 5342-0005. The current verification of two CPAs; 5342-0004 and 5342-0005 takes place in Nigeria.

**Scope of verification:**

The verification is an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the DOE. The verification includes the implementation and operation of the PoA as set out in the registered PoA-DD & revised CPA-DDs viz., 5342-0004 and 5342-0005 in the monitoring period. The verification tests the data and assertions set out in the monitoring report based on the following:

The verification tests the data and assertions set out in the monitoring report prepared for this monitoring period by the CMEs and is based on the following:

(i) The approved methodology AMS II.G version 03 “Energy efficiency measures in thermal applications of non-renewable biomass”
(ii) The registered and/or revised PoA-DD & CPA-DD and monitoring plan
(iii) UNFCCC criteria referred to in the Kyoto Protocol criteria and the CDM modalities and procedures as agreed in the Bonn Agreement and the Marrakech Accords
(iv) The CDM Validation and Verification Standard (VVS)
(v) The CDM Project Standard (PS) and Project Cycle Procedure (PCP)
(vi) Relevant decisions, guidance and clarifications of the CMP and CDM Executive Board and any other information and references relevant to the project activity’s reported emission reductions

The verification has considered both quantitative and qualitative aspects on stated/reported emission reductions. The monitoring report (all versions) and corresponding supporting documentation was assessed in accordance with the rules defined by UNFCCC, as appropriate to the PoA. The verification is not meant to provide any consulting or recommendations to the CME/others. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the monitoring activities.

***Verification Process:***

The verification process is conducted as per internal CDM Quality Manual, which includes the following steps;

a) Contract with CME and appointment of verification team and technical review team (refer Section B.1 and B.2 of this report)
b) Completeness check of Monitoring Report
c) Publication of Monitoring Report at UNFCCC website
d) Desk review (refer Section C.1 of this report) of Monitoring Report and corresponding ER sheet by verification team and planning of onsite audit (including sampling approach (refer Section C.4 of this report) to be applied)
e) On site audit (refer Section C.2 of this report) (physical implementation and interview with relevant stakeholders) by verification team consistent of Team Leader and all Technical Experts, as a minimum
f) Follow up activities e.g., interviews (refer Section C.3 of this report)

g) Reporting and closure of findings (CARs/CLs/FARs) and preparation of draft verification report (refer Section C.5 of this report)
h) Independent technical review (refer Section D of this report) of the draft verification report and final/revised documentation (e.g., Monitoring Report, corresponding ER sheet and evidences)
i) Reporting and closure of TR comments/findings (refer Section C.5 of this report) (CARs/CLs/FARs) and final approval for the decision made (refer Section E and F of this report).
j) Issuance of final verification report to contracted CME (or authorized representatives) and submission of request for issuance, as appropriate.

***Verification Conclusion:***
Based on the outcome of the verification process of the registered PoA "African Improved Cooking Stoves Programme of Activities" and its 02 CPAs (5342-0004 and 5342-0005) for the monitoring period 25/10/2014 - 24/10/2015 (including both dates) we confirm that the implementation of referenced registered PoA and CPAs is complying with applicable CDM rules and regulations as stated in the Monitoring Report (final) Version 2.2 dated 27/01/2017. The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AMS II.G Version 03 and the monitoring plan contained in the registered PoA-DD.

Earthood Services Private Limited is able to certify that the emission reductions from the registered CDM PoA UN#5342 "African Improved Cooking Stoves Programme of Activities" from its CPAs in Nigeria during the period 25/10/2014 - 24/10/2015 (including both days) amount to 20,040 $tCO_2e$. Therefore, this is being submitted for request for issuance, as per UNFCCC procedures.

## SECTION B. Verification team, technical reviewer and approver

### B.1. Verification team members

| No. | Role | Type of resource | Last name | First name | Affiliation (e.g. name of central or other office of DOE or outsourced entity) | Involvement in | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Desk review | On-site inspection | Interview(s) | Verification findings |
| 1. | Team Leader and verifier | IR | Deka | Nayan Jyoti | Central office | Y | Y | Y | Y |
| 2. | Technical expert | IR | Deka | Nayan Jyoti | Central office | Y | Y | Y | Y |
| 3. | Methodological Expert | IR | Gupta | Anshika | Central office | Y | N | N | Y |
| 4. | Local expert | EI | Ijeoma | Adeola | Central office | Y | N | N | Y |

### B.2. Technical reviewer and approver of the verification and certification report

| No. | Role | Type of resource | Last name | First name | Affiliation (e.g. name of central or other office of DOE or outsourced entity) |
|---|---|---|---|---|---|
| 1. | Technical reviewer | IR | Mahawar | Abhishek | Central Office |
| 2. | Technical expert | IR | Gautam | Ashok | Central Office |
| 3. | Approver | IR | Singh | Kaviraj | Central Office |

## SECTION C. Means of verification

### C.1. Desk review

The desk review involves:

- A review of the data and information presented to verify their completeness;

- A review of the monitoring plan, the monitoring methodology including applicable tool(s) and, where applicable, the applied standardized baseline, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures;
- A review of calculations and assumptions made in determining the GHG data and emission reductions;
- An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions;

The list of documents reviewed during the verification is provided under appendix 3 of this report.

## C.2. On-site inspection

| **Duration of on-site inspection:** 24/10/2016 to 29/10/2016 | | | | |
|---|---|---|---|---|
| **No.** | **Activity performed on-site** | **Site location** | **Date** | **Team member** |
| 1. | Physical site visit : Households visited (implementation of PoA) | Nigeria | 24/10/2016 to 29/10/2016 | Nayan Jyoti Deka |
| 2. | Review of information flows for generating, aggregating and reporting the monitoring parameters | Nigeria | 24/10/2016 to 29/10/2016 | Nayan Jyoti Deka |
| 3. | Cross check between information provided in the monitoring report and data from other sources such as project database, sales receipts etc; | Nigeria | 24/10/2016 to 29/10/2016 | Nayan Jyoti Deka |
| 4. | A check of the monitoring equipment including calibration performance and observations of monitoring practices against the applicable requirements | Nigeria | 24/10/2016 to 29/10/2016 | Nayan Jyoti Deka |
| 5. | Identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters | Nigeria | 24/10/2016 to 29/10/2016 | Nayan Jyoti Deka |

## C.3. Interviews

| **No.** | **Interviewee** | | | **Date** | **Subject** | **Team member** |
|---|---|---|---|---|---|---|
| | **Last name** | **First name** | **Affiliation** | | | |
| 1. | Olaore | Biodun | Envirofit Nigeria | 24/10/2016 to 29/10/2016 | Cookstove distribution, Sales Database, Monitoring survey, WBT, data recording | Nayan Jyoti Deka |
| 2 | Elizabeth | Djedo | Envirofit Nigeria | 24/10/2016 to 29/10/2016 | Sales Database & data recording | Nayan Jyoti Deka |
| 3 | Gideon | Ibinaiye | Envirofit Nigeria | 24/10/2016 | Sales Database & monitoring survey | Nayan Jyoti Deka |
| 4 | Odero | Clara | Envirofit Kenya | 27/10/2016 | WBT | Nayan Jyoti Deka |
| 5 | Lohia | Rohit | Envirofit International | 02/11/2016 | Monitoring report, Sampling calculations, ER calculations, | Nayan Jyoti Deka |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | Olaore | Modupe | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 7 | Toyin | Jimoh S | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 8 | Olufumilago | Ojo Esther | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 9 | Oyetunji | Muyiwa | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 10 | Olubunmi | Adebanjo | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 11 | Oluyinka | Makinde | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 12 | Edun | Olufunice | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 13 | Igwe | Angela | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 14 | Edun | Olabisi | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 15 | Joshep | Christiana | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 16 | Nuttu | Rijkatu | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 17 | Ezekie | Loda | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 18 | Dantani | Abigail | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 19 | Ibrahim | Lucas | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 20 | Dogo | Lami | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 21 | Samuel | Jumai | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 22 | Danladi | Salamatu | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |
| 23 | Alkali | Zainab | Household users | 24/10/2016 to 29/10/2016 | ICS usage | Nayan Jyoti Deka |

## C.4. Sampling approach

>>

A single sampling plan in accordance with AMS-II.G. version 3.0 was carried out for the specific case CPAs covered in this monitoring period. The CME has applied Simple Random Sampling across the CPAs for different monitoring parameters as per validated PoA DD and CPA DDs. 95/10 confidence precision was mainly applied by CME in the sampling, since 95/10 confidence applies for annual monitoring which is appropriate given the length of the monitoring period for the CPAs, which is one year and thus CME has

carried out annual monitoring. An annual monitoring criteria was followed and sampling and monitoring exercises were carried out for the monitoring period. The monitoring period covered the period between 25/10/2014 - 24/10/2015 (including both days).

The detailed sampling approach undertaken by CME is duly explained under Section G.3 of monitoring report.

**DOE's sampling approach**:

DOE has considered para 31 (a) & 31 (b) of "Standard for Sampling and surveys for CDM project activities and programmes of activities, Version 5" for determining the sampling size to be visited by DOE.
As per para 31 of "Standard for Sampling and surveys for CDM project activities and programmes of activities, Version 5*," A DOE may select a different sample size than the one indicated in paragraph 28, either by choosing a different value for the consumer risk and producer risk (e.g. 20% for the consumer risk) when applying acceptance sampling or by using another approach, if any of the following conditions apply:*

*(a) The estimated volume of annual emission reductions of the project activity or the PoA being verified is equal to or less than 100,000 tCO2e; or*

*(b) The security conditions in the project region prevents inspection of many samples (e.g. conflict zones); or*

(c) *The project activity or the PoA is located in a least developed country or a host Party with 10 or fewer registered CDM project activities at the end of the monitoring period being verified*.

In case of the current verification, the estimated annual emission reduction of the PoA being verified is less than 100,000 tCO2 thus meeting the requirement of para 31(a). Secondly, the PoA is located in a host country i.e. Nigeria, where the security condition in the project region prevent the inspections of many samples, thus also meeting the requirement of para 31(b). This has been confirmed from the US travel security (https://travel.state.gov/content/passports/en/alertswarnings/nigeria-travel-warning.html) advice & UK travel security advice (https://www.gov.uk/foreign-travel-advice/nigeria). Hence DOE has considered 8 samples from each type of ICS for the current verification.

The verification team determined the sample size for acceptance sampling by evaluating the following, using its own professional judgment and guidance in the Standard 'Sampling and surveys for CDM project activities and programme of activities' version 05.0:

- The proportion of discrepancies between the CME's data and verification team's (field or onsite inspection results) data that can be considered acceptable. This is referred to as the AQL (Acceptable Quality Level): 0.5% was considered in this verification.
- The proportion of discrepancies between the CME's data and verification team's (field or onsite inspection results) data that would be considered unacceptable. This is the UQL (Unacceptable Quality Level): 20% was considered in this verification.
- The producer risk of 10% and consumer risk of 20% was considered.

Considering the above input values, a sample size of 8 was required as per Table 1 in the referred Standard for each monitoring session. Accordingly, Acceptance number (c) thus determined for the sample size is 0. A sample size of 8 meets the criteria.
Accordingly, the verification team together has verified 9 samples for each type/model of ICS (i.e.9 for M5000 & 9 for CH2300 Cookstoves) for the CPAs (taking one additional sample for each type/model of ICS in order to meet minimum requirement of 8 samples ) to verify the parameters SOF , (Stove Operation Fraction), $f_{old}$ (The fraction of end users that are still using baseline (replaced) stoves) and $\mu_{old}$ (The amount of woody biomass consumption that is consumed through the continued use of old stoves) during site visit and observed that the sampling survey results of the CME for all the ICSs checked were consistent with DOE's field survey results. In all, the verification team visited 18 households for both the type/model of ICS (M5000 & CH2300) combined.

For other parameter viz. $\eta_{new,y}$ (Efficiency of the system being deployed as part of the project activity), $N_{all}$ (Total number of stoves installed) & $Stove_{year}$ (Calculated average stove operation years in the monitoring period) the verification team has checked from the document/evidence i.e. WBT test sheets, sales database etc. submitted by the CME.

## C.5. Clarification requests, corrective action requests and forward action requests raised

| Areas of verification findings | No. of CL | No. of CAR | No. of FAR |
|---|---|---|---|
| **General** | | | |
| Compliance of the monitoring report with the monitoring report form | | | |
| Remaining forward action requests from validation and/or previous verification | | | |
| Specific-case CPA(s) considered for verification and covered in this report | | | |
| **Programme of activities** | | | |
| Compliance of the programme implementation with the registered PoA-DD | 1 | | |
| Implementation and operation of the management system | | 1 | |
| Post-registration changes | | | |
| • Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline | | | |
| • Corrections | | | |
| • Inclusion of a monitoring plan in a registered PoA-DD (including its generic CPA-DD(s)) | | | |
| • Permanent changes to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline | | | |
| • Changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA | | | |
| • Types of changes specific to afforestation and reforestation activities | | | |
| **Component project activity(ies)** | | | |
| Compliance of the CPA implementation with the included CPA design document | | | |
| Post-registration changes | | | |
| • Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline | | | |
| • Corrections | | | |
| • Changes to the start date of the crediting period | | | |
| • Inclusion of a monitoring plan to an included CPA-DD | | | |
| • Permanent changes to the monitoring plan as described in the included CPA-DD, applied methodology, or applied standardized baseline | | | |
| • Changes to the programme design of the included CPA-DD | | | |
| • Types of changes specific to afforestation and reforestation component project activities | | | |
| Compliance of the monitoring plan with the monitoring methodology including applicable tool and standardized baseline | | | |
| Compliance of monitoring activities with the registered monitoring plan | | | |
| • Data and parameters fixed ex ante or at renewal of crediting period | | 1 | |
| • Data and parameters monitored | | 1 | |
| • Implementation of sampling plan | | 1 | |
| Compliance with the calibration frequency requirements for measuring instruments | | 1 | |
| Assessment of data and calculation of emission reductions | | 1 | |

| | | | |
|---|---|---|---|
| or net removals | | | |
| • Calculation of baseline GHG emissions or baseline net GHG removals by sinks | | 1 | |
| • Calculation of project GHG emissions or actual net GHG removals by sinks | | | |
| • Calculation of leakage GHG emissions | | | |
| • Summary of calculation of GHG emission reductions or net GHG removals by sinks | | | |
| • Comparison of actual GHG emission reductions or net GHG removals by sinks with estimates in included specific-case CPA | | | |
| • Remarks on difference from estimated value in registered PDD | | | |
| Others (please specify) | | | |
| **Total** | 1 | 7 | - |

## SECTION D. Internal quality control

A draft verification report prepared by verification team is reviewed by an independent technical review team (one or more members) to confirm whether all the internal procedures established and implemented by ESPL were duly complied with and such opinion/conclusion were reached in an objective manner that complies with the applicable CDM rules/requirements. The technical review team is collectively required to possess the technical expertise of all the technical area/sectoral scope the project activity relates to. All team members of technical review team are independent of the verification team.

During the technical review process additional findings may be identified or the closed out findings may be opened, which needs to be satisfactorily resolved before the request for issuance is submitted to UNFCCC. The independent technical reviewer may either approve the report as such or reject/return the same in such case providing the comments/findings/issues that needs to be resolved by the verification team. The decision taken by the Technical Reviewer is final and is authorized by the Managing Director on behalf of Earthood Services Private Limited.

## SECTION E. Verification opinion

Earthood Services Private Limited (ESPL), contracted by Envirofit International Ltd. (the CME for the PoA), has performed the third independent verification of the emission reductions for the registered CDM PoA 5342 “African Improved Cooking Stoves Programme of Activities” for its two CPAs in Nigeria under the PoA’s third monitoring period 25/10/2014 - 24/10/2015 (both days included) as reported in the Monitoring Report (public) Version 1 dated 15/09/2016. The CME is responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project activity.

This verification report is for the CPAs (5342-0004 and 5342-0005), which were included under the PoA as per the UNFCCC webpage at the end of the current monitoring period. A single monitoring report has been prepared by the CME for the same in which implementation of all referred CPAs along with monitoring results is included.

ESPL confirms that the monitoring system is in place and the emission reductions are calculated without material misstatements. This verification report has been prepared using the latest available template specified by UNFCCC and complies with the instructions to follow as per para 406 and 407 of CDM VVS Version 9.

The verification activities were conducted in accordance with ESPL’s CDM Quality Manual System as per the steps indicated under Section A of this report. The verification process has resulted in conclusion that the included CPAs confirm to the registered PoA DD as well as comply with applicable CDM rules and regulations and in accordance with applied monitoring methodology, AMS II.G Version 03. There was no FAR raised during validation of PoA / CPA inclusion, which required further attention from the verification team.

As a result, it is confirmed that the emission reductions from the CDM PoA 5342 “African Improved Cooking Stoves Programme of Activities” are correctly reported in the Monitoring Report (final) Version 2.2 dated 27/01/2017 and corresponding ER sheets for the monitoring period 25/10/2014 - 24/10/2015 (including both days) amount as 20,040 tCO2e. Therefore, this will be submitted as part of request for issuance as per CDM PCP Version 9.

## SECTION F. Certification statement

The verification approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. ESPL planned and performed the verification by obtaining evidence and other information and explanations that ESPL considered necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions reported for the PoA for the monitoring period 25/10/2014 - 24/10/2015 are fairly stated in the Monitoring Report (final) Version 2.2 dated 27/01/2017.

ESPL, based on outcome of verification activities, certify in writing that, during the monitoring period 25/10/2014 - 24/10/2015 (including both days), the registered CDM PoA "African Improved Cooking Stoves Programme of Activities" and all of the included CDM CPAs (5342-0004 and 5342-0005) in the registered CDM PoA achieved the verified amount of 20,040 $tCO_2e$ reductions in anthropogenic emissions by sources of greenhouse gases that would not have occurred in the absence of the CPAs.

The verified amount of emission reductions is stated below as per each CPAs and as per commitment period;

| | Emission Reductions (Amount) in this monitoring period (in $tCO_2e$) | |
|---|---|---|
| **CPAs (included in this request)** | **Up to 31/12/2012 (1st commitment period)** | **01/01/2013 onwards** |
| 5342-0004 | 0 | 2,423 |
| 5342-0005 | 0 | 17,617 |
| **Total** | **0** | **20,040** |

## SECTION G. Verification findings - General

### G.1. Compliance of the monitoring report with the monitoring report form

| | |
|---|---|
| **Means of verification** | The verification team has compared the monitoring report with the applicable monitoring report form. |
| **Findings** | No finding was raised. |
| **Conclusion** | Monitoring report is prepared using the correct template i.e. CDM-PoA-MR-FORM Version 01.0. The verification team confirms that the monitoring report has been appropriately prepared using the applicable monitoring report form, and that all sections are completed. |

### G.2. Remaining forward action requests from validation and/or previous verification

>> There were no FARs during validation of PoA and inclusion of CPA as well which needs to be closed during this monitoring period

### G.3. Specific-case CPA(s) considered for verification and covered in this report

| Reference number of the specific-case CPA included in the PoA as of the end of this monitoring period | Is the specific-case CPA considered for this verification? (yes/no) | Version number of the registered PoA-DD to which the specific-case CPA complies with | Confirmation that a request for issuance including the specific-case CPA has been published for the previous monitoring period (Y/N) |
|---|---|---|---|
| 5342-0001 | No | Version 4.3 dated 07/06/2014 | Y |
| 5342-0002 | No | Version 4.3 dated 07/06/2014 | Y |
| 5342-0003 | No | Version 4.3 dated 07/06/2014 | Y |
| 5342-0004 | Yes | Version 4.3 dated 07/06/2014 | Y |
| 5342-0005 | Yes | Version 4.3 dated 07/06/2014 | Y |
| 5342-0006 | No | Version 4.3 dated 07/06/2014 | N |

## SECTION H. Verification findings – Programme of activities

### H.1. Compliance of the programme implementation with the registered programme design document

**Means of verification**

The registered PoA involves the promotion, distribution and sale of improved cook stoves (ICS) in regions of Ghana, Nigeria and Liberia. The overall responsibility of implementation and operation is with CME, which was also evident during the site visit. This was found to be consistent with PoA-DD/01/. There are total 6 CPAs (5342-0001, 5342-0002, 5342-0003, 5342-0004, 5342-0005 & 5342-0006) found implemented at the end date of current monitoring period. This monitoring report includes the implementation and monitoring of two CPAs (5342-0004 & 5342-0005) as part of registered PoA.

The implementation of the CPA (included in this request), as referenced above, are within the geographical boundary of the PoA DD. The two CPAs(5342-0004 & 5342-0005) are located in Nigeria.

The type of ICS distributed under the CPAs is of type/model M5000 & CH2300 which was inline to the registered PoA-DD/01/ and CPA-DDs/03,04/. The design efficiency of the ICSs is 29.7%( type M5000) and 39.4%(type CH2300) with a life span of 5 years each/03,04/.

Technical specifications of the ICSs were verified through the details provided by supplier /23,24/, and found to be consistent with information given in monitoring report.

The verification team has confirmed that the number of ICS deployed under the current CPAs is under the limit as set by the CME during the inclusion of each CPA and thus CPAs remain under the threshold of 180 GWh thermal energy savings/year. The total number of ICS deployed are 6981 which is well within the maximum limit for the ICS distribution which is 27,926 as per the registered CPA DDs combined together.

| ICS type | Quantity of ICS Sold / Disseminated during the current verification | Maximum Estimated Qty ICSs in CPA | CPA |
|---|---|---|---|
| M5000 | 847 | 13,658 | 5342-0004 |
| CH2300 | 6,134 | 14,268 | 5342-0005 |

The verification team is able to confirm that the quantity, specification and target group of the ICS is consistent with the PoA DD /01/ and respective CPA DD/3,4/. Further, based on the review of ICS distribution database in ER sheet/11/, physical observations and interview conducted during the site visit, the verification team found that:

- The CPA is implemented within the boundary of the PoA as described in the PoA-DD.
- The CME is same as that mentioned in the PoA-DD
- The implementation and operation of the project activity has been conducted in accordance with the description contained in the PoA-DD and included CPA-DD.
- All physical features of the CPA proposed in the included CPA-DD are in place
- The project participants/CPA implementer has operated the CPA as per the included CPA-DD.

The verification team has visited the households during site visit. It was observed that each ICS was assigned a unique identification number, which takes care that no double counting happens. The unique identification number on each ICS, personal information of ICS owners and commissioning date of ICS was cross checked with the Sales database in ER sheet/11/. The operation of the ICS was

| | |
|---|---|
| | confirmed through interviews of owners/representatives (of ICS) during the site visit.<br><br>The emission reductions being claimed during this monitoring period are lesser than the estimated emission reductions in the included CPA-DD. The estimated CERs were 88,318 $tCO_2e$ whereas achieved ERs are 20,040 $tCO_2e$ for the current verification.<br>The CPA wise estimated CERs & achieved ERs are mentioned below –<br><br>CPA 5342 – 0004 – Estimated CERs were 44,159 $tCO_2e$ & achieved ER are – 2,423 $tCO_2e$<br>CPA 5342 – 0005 - Estimated CERs were 44,159 $tCO_2e$ & achieved ER are – 17,617 $tCO_2e$<br><br>The verification team considers the project description of the project contained in the PoA-DD is complete and accurate. The PoA-DD complies with the relevant methodology, tools, forms and guidance at the time of PoA submission for registration. The monitoring report was compared and verified against the description provided in the PoA-DD and found to be correct |
| **Findings** | CL#01 was raised and closed. |
| **Conclusion** | a) The verification team confirms that the physical features (technology/type of ICS) of the implementation were in accordance with the PoA DD.<br>b) The actual operation is in line to respective CPA DD, which is further explained under Section I.1, J.1 and K.1 of this report.<br>c) The number of installations in the CPA for the type of ICS were less than the maximum quantity estimated in the CPA-DD. This is due to the reason that the ICS are subject to the physical sale of stoves by retailers during the CPA lifetime which is based on the market demand for the product.<br>d) The actual CERs for CPA were lower for comparable monitoring period. No information with regard to data and variables was identified that may surpass the estimated quantity of ERs in the CPA DD |

### H.2. Implementation and operation of the management system

| | |
|---|---|
| **Means of verification** | Based on the interview of CME representatives and monitoring team during the site visit, it is confirmed that the CME has organized an appropriate management and operational system for monitoring and reporting.<br><br>Envirofit International Ltd. is CME for the PoA and responsible for inclusion of CPAs in the PoA.<br><br>CME records the unique identification number, location, and installation date of each ICS in each CPA, helps to identify, locate and verify any or all of the ICS installations in particular CPA. The assessment team has checked the cookstove sales database in the CME's system during the site visit to ascertain the record keeping system of the CME.<br><br>CME is responsible for QA/QC of the data, analysis and reporting into the monitoring report. For survey data, monitoring team consist of the team member from CME which is consisting of trained monitoring staff, who conducted the surveys and WBTs. The monitoring manager at the CME is responsible for QA/QC of the data, analysis and reporting into the monitoring report /9/. The trainings are imparted to the monitoring & survey team by the CME's trained person, and the CME has provided the PPT "Monitoring Survey Training Presentation"/29/ to the assessment team. The assessment team has checked the PPT for the training and also interviewed few of the trained monitoring staff during the site visit and found that they (monitoring & survey team) are well trained to carry out the task. Regular trainings are provided to the field team as a part of continuous improvement procedures. |
| **Findings** | CAR#02 was raised and closed. |
| **Conclusion** | The verification team assessed the management systems in place to implement the monitoring of the PoA. This included the roles and responsibilities, data collection, transfer and aggregation procedures, data storage and archiving for the monitoring |

| | |
|---|---|
| | system. The roles and responsibilities data collection transfer and aggregation procedures, data storage and archiving for the monitoring system have been provided in the MR /09/. The verification team confirms that the monitoring management system of the PoA is in place with the responsibilities properly identified and established. |

### H.3. Post-registration changes

#### H.3.1. Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline

>> Not applicable

#### H.3.2. Corrections

>> Not applicable

#### H.3.3. Inclusion of a monitoring plan in a registered PoA-DD (including its generic CPA-DD(s))

>> Not applicable

#### H.3.4. Permanent changes to the monitoring plan as described in the registered PoA-DD, applied methodology, or applied standardized baseline

>> Not applicable

#### H.3.5. Changes to the programme design of the registered PoA-DD (including corresponding changes to project design of the generic CPA-DD(s)) and updates to the eligibility criteria for inclusion of specific-case CPAs in the PoA

>> Not applicable

#### H.3.6. Types of changes specific to afforestation and reforestation activities

>> Not applicable

## SECTION I. Verification findings – Component project activity(ies)

### I.1. Compliance of the CPA implementation with the included CPA design document

**Means of verification**

CPA 5342-0004 & CPA 5342-0005 described in this section targets the promotion, distribution and sale of ICS/Improved Cook Stoves of model M5000 & CH2300 respectively, of ICS implemented in this CPA till date. Envirofit International Ltd. is the CPA implementer for the implementation of CPA.

| CPA Ref. # | 5342-0004 | 5342-0005 |
|---|---|---|
| Inclusion date of CPA under current verification | 23/09/2014 | 23/09/2014 |
| Location | Nigeria | Nigeria |
| Product Type | ICS | ICS |
| ICS Model | M5000 | CH2300 |
| Quantity Sold / Disseminated | 847 | 6,134 |
| Maximum Estimated Qty ICSs in CPA | 13,658 | 14,268 |
| ICS sales start date | 06/02/2013 | 09/01/2013 |
| Estimated CERs (comparable period) | 44,159 | 44,159 |
| Actual CERs from the ICS Type | 2,423 | 17,617 |

ICS were distributed in Nigeria, which is consistent with the description given in the

| | |
|---|---|
| | included CPA-DD. By the end of current monitoring period the total number of cook stoves disseminated under the two CPAs, is within estimated quantity of ICSs as per CPA DDs. It has been checked by the verification team that the CPA is way below the threshold of 180 GWh/year (thermal). |
| **Findings** | No findings |
| **Conclusion** | a) The verification team is of the opinion that physical features of the CPAs have been implemented in accordance with the CPA-DD.<br>b) No specific monitoring equipment had to be installed according to the monitoring plan.<br>c) It is also confirmed, through the physical site visit and review of the supporting documentation that physical features of the component CPAs have been implemented in accordance with the CPA-DD.<br>d) The CPAs were also found to be completely operational in line with the CPA-DD.<br>e) The information provided in the relevant sections of the monitoring report are appropriately describe the implementation and operational status of the PoA. |

### I.2. Post-registration changes

#### I.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

>> Not applicable

#### I.2.2. Corrections

>> Not applicable

#### I.2.3. Changes to the start date of the crediting period

>> Not applicable

#### I.2.4. Inclusion of a monitoring plan to an included CPA-DD

>> Not applicable

#### I.2.5. Permanent changes to the monitoring plan as described in the included CPA-DD, applied methodology, or applied standardized baseline

>> Not applicable

#### I.2.6. Changes to the programme design of the included CPA-DD

>> Not applicable

#### I.2.7. Types of changes specific to afforestation and reforestation component project activities

>> Not applicable

### I.3. Compliance of monitoring plan with the monitoring methodology including applicable tool and standardized baseline

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|---|---|
| **Means of verification** | The monitoring plan as contained in respective CPA-DD was reviewed against the monitoring requirements of the applied methodology AMS-II.G version 03 /7/ as well as PoA-DD with reference to the technology involved. Based on this review it was found that the monitoring plan contained in the CPA-DD includes all the |

| | |
|---|---|
| | required parameters to be monitored in the context of the CPA design and description and allows proper determination of emission reductions in accordance with PoA-DD and applied methodology AMS-II.G version 03 /7/. |
| **Findings** | No finding was raised. |
| **Conclusion** | The monitoring plan is in accordance with the approved methodology, AMS-II.G version 03 /7/, that is included in each respective CPA-DDs. |

## I.4. Compliance of monitoring activities with the registered monitoring plan

### I.4.1. Data and parameters fixed ex ante or at renewal of crediting period

#### I.4.1.1. Annual average biomass consumption per appliance, $Q_{biomass}$, Tonnes/year

| | |
|---|---|
| **Means of verification** | The value considered for this monitoring period is<br>4.50 tonne/year for CPA 0005 for CH2300<br>4.94 tonne/year for CPA 0004 for M5000<br>which was cross-checked with PoA-DD/01/ and CPA-DDs/3,4/. It was found to be consistent. It was correctly used in ER sheet as well. |
| **Findings** | CAR#03 was raised and closed. |
| **Conclusion** | The values in the Monitoring Report /9/ and corresponding Emission Reduction Spreadsheet /11/ are consistent with the PoA-DD and CPA-DDs for 5342-0004 and 5342-0005. The values applied for ER calculations in the relevant CPAs are correct and justified. |

#### I.4.1.2. Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass, fNRB,y , Fraction

| | |
|---|---|
| **Means of verification** | The value considered for this monitoring period is 0.93 for CPA 5342-0004 and 5342-0005 which was cross-checked with PoA-DD/01/ and CPA-DDs/3,4/. It was found to be consistent. It was correctly used in ER sheet as well. |
| **Findings** | No finding was raised. |
| **Conclusion** | The values in the Monitoring Report /9/ and corresponding Emission Reduction Spreadsheet /11/ are consistent with the PoA-DD and CPA-DDs. The values applied for ER calculations in the relevant CPAs are correct and justified. |

#### I.4.1.3. Net calorific value of the non-renewable biomass that is substituted, $NCV_{biomass}$ , TJ/tonne

| | |
|---|---|
| **Means of verification** | The value considered for this monitoring period is 0.015 for CPA 5342-0004 and 5342-0005 which was cross-checked with source of information (IPCC guidelines for National Greenhouse Gas Inventories/12/), PoA-DD/01/ and CPA-DDs/3,4/. It was found to be consistent. It was correctly used in ER sheet as well. |
| **Findings** | |
| **Conclusion** | The values in the Monitoring Report /9/ and corresponding Emission Reduction Spreadsheet /11/ are consistent with the PoA-DD and CPA-DD. The values applied for ER calculations in the relevant CPAs are correct and justified. |

#### I.4.1.4. Emission factor for the substitution of non-renewable biomass by similar consumers, $EF_{projected\_fossilfuel}$, $tCO_2/TJ$

| | |
|---|---|
| **Means of verification** | The value considered for this monitoring period is 81.6 for CPA 5342-0004 and 5342-0005 which was cross-checked with source of information (IPCC guidelines for National Greenhouse Gas Inventories/12/), PoA-DD/01/ and CPA-DDs/3,4/. It was found to be consistent. It was correctly used in ER sheet as well. |
| **Findings** | No finding was raised. |
| **Conclusion** | The values in the Monitoring Report /9/ and corresponding Emission Reduction Spreadsheet /11/ are consistent with the PoA-DD and CPA-DD. The values applied for ER calculations in the relevant CPAs are correct and justified. |

#### I.4.1.5. Efficiency of the system being replaced, $\eta_{old}$, Efficiency

| | |
|---|---|
| **Means of verification** | The value considered for this monitoring period is 0.106 for CPA 5342-0004 and 5342-0005which was cross-checked with applied methodology/7/, PoA-DD/01/ and CPA-DDs/3,4/. It was found to be consistent. It was correctly used in ER sheet as well. |
| **Findings** | No finding was raised. |

| | |
|---|---|
| **Conclusion** | The values in the Monitoring Report /9/ and corresponding Emission Reduction Spreadsheet /11/ are consistent with the PoA-DD and CPA-DD. The values applied for ER calculations in the relevant CPAs are correct and justified. |

#### I.4.1.6. Net to gross adjustment factor to account for leakages, LAF, Fraction

| | |
|---|---|
| **Means of verification** | The value considered for this monitoring period is 0.95 for CPA 5342-0004 and 5342-0005 which was cross-checked with, applied methodology/7/, PoA-DD/01/ and CPA-DDs/3,4/. It was found to be consistent. It was correctly used in ER sheet as well. |
| **Findings** | No finding was raised. |
| **Conclusion** | The values in the Monitoring Report /9/ and corresponding Emission Reduction Spreadsheet /11/ are consistent with the PoA-DD and CPA-DDs. The values applied for ER calculations in the relevant CPAs are correct and justified. |

### I.4.2. Data and parameters monitored

#### I.4.2.1. Efficiency of the system being deployed as part of the project activity, $\eta_{new}$, Efficiency

**Means of verification**

| Criteria/Requirements | Assessment/Observation |
|---|---|
| Measuring /Reading /Recording frequency | Measured Annually |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes. The measuring and reporting frequency are in line to registered CDM PoA DD/1/, CPA DDs/3,4/ and applied methodology. |
| Monitoring equipment | The WBT tests/21,22/ were conducted by trained CME personal and undertaken according to a methodology supported by PCIA /20/ by an experienced party. The PoA DD or CPA DDs do not prescribe any specific monitoring equipment but weighing scale, moisture meter and thermometer were required and used to conduct WBT.<br><br>The details of the equipment used for WBT are mentioned below -<br><br>**Equipment**<br><br>**Mini-thermometer:**<br>Brand: Omega<br>Model: Omegaette HH308 Type K<br>Accuracy: +/- 0.3% reading +1$^0$C<br>Number of units: 1<br>S/N:141203660<br><br>**Mass balance**<br>Brand: LW Measurements<br>Model: MCT-33 Plus<br>Accuracy: +/- 2 division, +/- 0.002 lbs<br>Number of units: 1<br>S/N: MCP1408033<br><br>**Moisture Meter**<br>Brand: Delmhorst<br>Model: J2000<br>Accuracy: +/- 0.2%<br>Number of units: 1<br>S/N: 38784<br><br>It is noteworthy that all the above equipment's are newly purchased equipment's and/or are pre calibrated by the |

| | | |
|---|---|---|
| | | manufacturer.<br><br>The assessment team has checked the user manual of the respective monitoring equipment as follows:.<br><br>The moisture meter (Delmhorst J2000) has a calibration checking feature in-built into it. As per the manual/25/, once the calibration check button is pressed, the screen shall show a reading of 12.0. A value of 12.0 confirms that the meter is under calibration and good for use. If the screen does not show a reading of 12.0 it must be sent to Delmhorst for re-calibration. The snapshot of the screen (showing a reading of 12.0)/31/ taken before the start of tests has been checked by the assessment team. Also, the reading of 12.0 was confirmed during the verification site visit.<br><br>The weighing scale (MCT-33 Plus) used has an in-built calibration software called as ANYCAL. The DoE confirmed the same from the specification sheet/28/ for the weighting scale which mentions that the unit has an auto-calibration feature using ANYCAL software.<br><br>The thermometer used for WBT (Omegaette HH308) is a new unit. The manufacturer factory calibration certificate/26/ has been submitted substantiating that the unit was pre-calibrated at the time of testing. The date of first use of this thermometer was 25 April 2016. The manufacturer recommends a standard calibration frequency of once a year as per the email received by PP from manufacturer /27/ Hence the calibration is deemed valid till 24 April 2017 (i.e. one year from date of first use).<br><br>Thus, the assessment team confirms that the measurements were done with necessary guarantees. |
| | Calibration frequency /interval: | Not applicable |
| | How were the values in the monitoring report verified? | The Water boiling test report/21,22/ provided by PP has been checked.<br>The value of the parameter is mentioned below as per type/ model of ICS<br><br>**Stove model** \| **CPA** \| **Monitored Efficiency (session#1)**<br>M5000 \| 4 \| 28.64%<br>CH2300 \| 5 \| 32.35%<br><br>It is noteworthy that WBT has been conducted for both type/ model of ICS involves in the current verification. |
| | If applicable, has the reported data been cross-checked with other available data? | The verification team has checked all the stove efficiency test (WBT) results and found out the efficiency of the ICS to be consistent. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | QA/QC procedures were found to be appropriate and reliable. The WBTs were conducted in line with the guidance provided by the CME and according to a methodology supported by PCIA. The said documentation has been checked from PCIA website http://www.pciaonline.org/testing. The Water boiling test report/21,22/ provided by PP has been checked and found to be satisfactory. |

| | | |
|---|---|---|
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard? | Not applicable |
| **Findings** | CAR#04 was raised and closed. | |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the registered monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. | |

**I.4.2.2. Total number of stoves installed, $N_{all}$, Number**

| **Means of verification** | **Criteria/Requirements** | **Assessment/Observation** |
|---|---|---|
| | Measuring /Reading /Recording frequency | Measured Annually |
| | Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes. The measuring and reporting frequency are in line to registered CDM PoA DD/1/, CPA DD/3,4/ and applied methodology. |
| | Monitoring equipment | CPA Distribution Records and logbooks (Sales database) |
| | Calibration frequency /interval: | Not applicable |
| | How were the values in the monitoring report verified? | The values in the MR have been verified from the Sales database18/. |

| **Stove model** | **Value (number)** | **CPA** |
|---|---|---|
| CH2300 | 6134 | Applicable to CPA0005 |
| M5000 | 847 | Applicable to CPA0004 |

| | | |
|---|---|---|
| | If applicable, has the reported data been cross-checked with other available data? | The survey results, assumptions and sales records were checked by the verification team and were found acceptable. The results are reproducible in the corresponding ER sheet/11/ of final Monitoring Report/9/. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | QA/QC procedures were found to be appropriate and reliable. The sales database was regularly checked by the business head in order to ascertain that there were no errors while recording the ICS information in the sales database w.r.t the cook stove serial numbers, name of the owner, location etc. This has been verified during the site visit by the assessment team by interviewing the business head & the person responsible for the data recording (MIS). |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been | Not applicable |

| | | |
|---|---|---|
| | approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard? | |
| **Findings** | No findings | |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the registered monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. | |

**I.4.2.3. Stove Operation Fraction – used to determine the share of distributed stoves that are still operating, measured ex-post through sampling,** SOF, **Fraction**

| **Means of verification** | **Criteria/Requirements** | **Assessment/Observation** |
|---|---|---|
| | Measuring /Reading /Recording frequency | Measured Annually |
| | Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes. The measuring and reporting frequency are in line to registered CDM PoA DD/1/, CPA DDs/3,4/ and applied methodology. |
| | Monitoring equipment | Survey questionnaires |
| | Calibration frequency /interval: | Not applicable |
| | How were the values in the monitoring report verified? | The values in the MR have been verified from the Monitoring Survey results/18/. |
| | If applicable, has the reported data been cross-checked with other available data? | The survey results, assumptions and sales records were checked by the verification team and were found acceptable. The results are reproducible in the corresponding ER sheet/11/ of final Monitoring Report/9/.<br><br>The verification team randomly selected 18 samples (9 samples for each model of stove i.e M5000& CH2300) for DOE's field survey/32/ and via on-site interview found out that all the ICS which are picked up for sampling are installed at the household and are in working condition, which was consistent with the CME's sample survey result. |

| **Stove model** | **Value (fraction)** | **Number of stoves still operational** | **CPA** |
|---|---|---|---|
| CH2300 | 0.950 | 57 out of 60 samples for CH2300 were found to be in operation | CPA0005 |
| M5000 | 0.951 | 58 out of 61 samples for M5000 were found to be in operation | CPA0004 |

| | | |
|---|---|---|
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | QA/QC procedures were found to be appropriate and reliable. The person responsible for the monitoring & survey are well trained which is evident from the site visit interview. The assessment team has also checked the monitoring survey results /18/ vis-à-vis the DOE site visit samples and found that the results are comparable. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard? | Not applicable |
| **Findings** | No findings | |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the registered monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. | |

**I.4.2.4. The fraction of end users that are still using baseline (replaced) stoves, $f_{old}$, Fraction**

| **Means of verification** | **Criteria/Requirements** | **Assessment/Observation** |
|---|---|---|
| | Measuring /Reading /Recording frequency | Annually |
| | Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes |
| | Monitoring equipment | Survey questionnaire |
| | Calibration frequency /interval: | Not applicable |
| | How were the values in the monitoring report verified? | The values in the MR have been verified from the survey questionnaire in the monitoring survey records/18/. The survey questionnaire are based on the interviews of selected sample households in which the ICS are implemented and functioning. |

| **Stove model** | **Value (fraction)** | **CPA** |
|---|---|---|
| CH2300 | 0.000 | CPA0005 |
| M5000 | 0.138 | CPA0004 |

The parameter $\mathbf{f_{old}}$ was measured ex-post by estimation of a representative sample of end users using the deployed ICS, as conducted in line with the PoA Sampling Plan.

Sampling estimated the value of this parameter through monitoring the fraction of end users not using baseline stoves (fnon-old),

Based on the registered CPA-DD, the fraction of users not using the baseline stoves (fnon,old) has been monitored. Then fold has been calculated as 1 – fnon-old.

| | | |
|---|---|---|
| | | 0 out of 57 samples were found using CH2300 and baseline stove together<br>8 out of 58 samples were found using M5000 and baseline stove together |
| | If applicable, has the reported data been cross-checked with other available data? | The survey results, assumptions and sales records were checked by the verification team and were found acceptable. The results are reproducible in the corresponding ER sheet/11/ of final Monitoring Report/9/.<br>The verification team randomly selected 18 samples (9 samples for each stove model) for DOE's field survey and via on-site interview found out the fraction of end users that are still using baseline (replaced) stoves, $\mathbf{f_{old}}$, which was consistent with the CME's sample survey result. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | QA/QC procedures were found to be appropriate and reliable. . The person responsible for the monitoring & survey are well trained which is evident from the site visit interview. The assessment team has also checked the monitoring survey results /18/ vis-à-vis the DOE site visit samples and found that the results are comparable. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard? | Not applicable |
| **Findings** | No findings. | |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the registered monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. | |

**I.4.2.5. The amount of woody biomass consumption that is consumed through the continued use of old stoves, $\mu_{old}$, kg/year**

| **Means of verification** | **Criteria/Requirements** | **Assessment/Observation** |
|---|---|---|
| | Measuring /Reading /Recording frequency | Annually |
| | Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes |
| | Monitoring equipment | Survey questionnaire |
| | Calibration frequency /interval: | Not applicable |
| | How were the values in the monitoring report verified? | The values in the MR have been verified from the survey questionnaire the survey questionnaire in the monitoring survey records /18/. The survey questionnaires are based on the interviews of selected sample households in which the ICS are implemented and functioning and baseline stove is also found in use along with ICS |

| | | |
|---|---|---|
| | | **Stove model** / **Value (kg/year)** / **CPA**<br>CH2300 / 0.000 / CPA 0005<br>M5000 / 136.9 / CPA 0004<br>The parameter $\mu_{old}$, was calculated by multiplying the Total Annual Fuel Consumption, $Q_{biomass}$, by the ratio of meals cooked by the traditional stove in operation before and after purchasing the Envirofit Stove.<br>The parameter value for CH2300 is deemed as zero as during monitoring, none of the CH2300 sampled user were found using baseline stoves i.e.$f_{old}$ CH2300 = 0 |
| | If applicable, has the reported data been cross-checked with other available data? | The survey results, assumptions and sales records were checked by the verification team and were found acceptable. The results are reproducible in the corresponding ER sheet/11/ of final Monitoring Report/9/.<br>The verification team randomly selected 18 samples (9 samples for each stove model) for DOE's field survey/32/ and via on-site interview found out the Quantity of woody biomass that is still consumed by the customers using their baseline cook stoves, which was consistent with the CME's sample survey result. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | QA/QC procedures were found to be appropriate and reliable. The person responsible for the monitoring & survey are well trained which is evident from the site visit interview. The assessment team has also checked the monitoring survey results /18/ vis-à-vis the DOE site visit samples and found that the results are comparable. |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard? | Not applicable |
| **Findings** | No finding was raised. | |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the registered monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. | |

**I.4.2.6. Calculated average stove operation years in the monitoring period,** $Stove_{year}$**, Year**

| **Means of verification** | **Criteria/Requirements** | **Assessment/Observation** |
|---|---|---|
| | Measuring /Reading /Recording frequency | Annual |
| | Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes |
| | Monitoring equipment | PoA Distribution and Monitoring Database(sales database) |
| | Calibration frequency /interval: | Not applicable |

| | | |
|---|---|---|
| | How were the values in the monitoring report verified? | The values in the MR have been verified from PoA Distribution and Monitoring Database included in the ER sheet /11/. Each ICS entered into the PoA Distribution and Monitoring Database was linked to a distribution date (recorded during distribution). Thus for any monitoring period it is possible to calculate the period of time that the stoves included in the emissions reduction calculations for that period have been operating. |
| | If applicable, has the reported data been cross-checked with other available data? | The sales records were checked by the verification team and were found acceptable. The results are reproducible in the corresponding ER sheet/11/ of final Monitoring Report/9/. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | QA/QC procedures were found to be appropriate and reliable. The sales database was regularly checked by the business head in order to ascertain that there were no errors while recording the ICS information in the sales database w.r.t the cook stove serial numbers, name of the owner, location etc. This has been verified during the site visit by the assessment team by interviewing the business head & the person responsible for the data recording (MIS). |
| | In case project participants have temporarily not monitored the parameter, has either i) a deviation been approved by the CDM EB or ii) has the parameter been estimated as stipulated by Appendix 1 to the CDM Project Standard? | Not applicable |
| **Findings** | No finding was raised. | |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the registered monitoring plan (as per measurement methods and procedures to be applied) and applied methodology. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan. | |

| Stove model | Value (fraction) | CPA |
|---|---|---|
| CH2300 | 0.92 | Applicable to CPA0005 |
| M5000 | 0.90 | Applicable to CPA0004 |

### I.4.3. Implementation of sampling plan

| | |
|---|---|
| **Means of verification** | The monitoring has been carried out in accordance with the monitoring plan contained in the revised approved PoA DD /1/ and CPA DDs /3,4/.<br>The monitoring period covered the period between and including 25/10/2014 – 24/10/2015.<br><br>A single sampling plan was carried out across all specific-case CPAs covered in this monitoring period. The 2 CPAs 5342-0004 and 5342-0005 were covered in the single sampling plan.<br><br>**Sampling Design/Target Population/Sampling Frame/Reliability:**<br>A simple random sampling method was used by PP, which is in line with the monitoring plan of the PoA DD (Section B.7.2) and the respective CPA-DDs. In a single sampling design both the CPAs were included together under the current monitoring period. The sampling approach considered confidence level and precision as 95/10 in line with the requirement of Standard for "Sampling and Surveys for CDM |

Project Activities and Programme of Activities" version 05.0/16/.

As per page 53 of the PoA-DD/1/, for the parameter $\eta_{new}$, the population of each stove model shall be deemed homogeneous across CPAs as the stoves have been designed to meet stringent efficiency specifications and are manufactured in factories to specification. The PP therefore has calculated sample size for $\eta_{new}$ considering each stove model as separate population. As per page 53 and page 57 of the PoA-DD, for other parameters (SOF, fold, μold), the homogeneity of the population was demonstrated in compliance with the following conditions;

| Homogeneity condition | Characteristic of Population | Status of population | Assessment team conclusion |
|---|---|---|---|
| Country | all units have been distributed in the same geographical area, i.e. Nigeria/32/ | homogeneous | Ok, based on assessment of stove sales database for CPA 5342-0004 and 5342-0005, all stove units have been distributed within Nigeria. |
| Fuel Type – charcoal / wood fuel | There are two fuel type in the population: Charcoal and woodfuel./32/ | Charcoal stoves have been considered as one sampling frame and wood fuel stove have been considered as other sampling frame. | Ok, considering charcoal stove and woodfuel stoves in separate sampling frames in in line with registered sampling plan and is deemed appropriate by the assessment team. |
| End user – domestic / small-medium enterprises / community | all units are for domestic (household) usage as per their design/32/ | Homogeneous within each sampling frame | Ok, the stoves models are small portable stoves suited for domestic usage only by virtue of their design. During the verification site visit the assessment further confirmed that the usage of the stoves was for domestic purposes through interviews of sampled households. |
| Stove Type - efficiencies are in a similar range defined as being within +/-10% of each other and they have other common design features | There is only one model under each sampling frame (for charcoal it is CH2300 and for woodfuel it is M5000) | Homogeneous within each sample frame | Ok |

**Sampling Method:**

Simple Random Sampling approach was used and samples were randomly selected from the designated sampling frames which included all ICS disseminated up to the end of the monitoring period. To ensure a random selection of ICS, random number generators was applied. Each ICS in the target sampling frame is uniquely identifiable by its unique ID number. Each ICS was allocated a Sample Selection Number, starting at 1 and increasing up to the total number of ICS in the pre-defined sampling frame. Applying the random number generators, the ICS were randomly chosen from the defined sampling frame up to the required sample size as calculated by the CME.

**Sample Size (Required and Actual) for Parameter of Interest:**
The sampling is applied to the following monitoring parameters:
1. The thermal efficiency of the ICS distributed (%): $\eta_{new,y}$
2. The Stove Operating Fraction, i.e. the fraction of users using the ICS: SOF
3. The fraction of stove users still using baseline (replaced) stoves: $f_{old}$
4. The amount of woody biomass that continues to be used in the replaced stoves (kg) : $\mu_{old}$

In order to calculate the sample size estimates, the expected parameter values (mean, standard deviation and proportion) 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", Version 05.0

The required sample sizes were correctly derived using equation (1) on page 68 and equation (4) on page 70 of the Guideline: Sampling and surveys for CDM project activities and programmes of activities, Version 04.0/17/ for proportion based and mean based parameters respectively as follows:

$$n = \frac{z^2 \cdot N \cdot V}{(N-1) \cdot c^2 + z^2 \cdot V}$$

$V = (\frac{SD}{Mean})^2$ for mean parameters

$V = p \cdot (1-p)/p^2$ for proportion parameters

Where:

$n$ = sample size

$N$ = population size
$z$ = Confidence value constant (1.96 for 95%)
$c$ = Desired precision (10%)
$SD$ = expected standard deviation for mean parameter
$Mean$ = expected mean for mean parameter
$p$ = expected proportion for proportion based parameter

Also, the use of t-distribution formula in line with paragraph 13 of the Standard: Sampling and surveys for CDM project activities and programmes of activities, version 5.0 was correctly applied in case the sample size for mean parameter was found as less than 30. The formula used for adjusted sample size calculation is similar to that specified above, however instead of z value constant, student distribution t-constant (for the given confidence) has been used as follows:

$$n = \frac{t^2 \cdot N \cdot V}{(N-1) \cdot c^2 + t^2 \cdot V}$$

where t = Student's t-distribution constant at given confidence level. All other parameters remain same as specified on page 5 of MR. The parameters used to determine the t-constant are confidence level and degrees of freedom. The confidence level has been taken as 95%. The degrees of freedom is equal to (n-1) where n is the sample size arrived at using equation in page 5 of MR (less than 30). The sample size is iterated unless the sample size value becomes stable and equal to that arrived in preceding iterations.

Based on the assumptions following calculation were done as included under sample size calculation (worksheet “Sheet 3”)/11/.

| Parameter | Total population (N) | Expected results | Reliability | Required Sample Size (n) | Monitored samples |
|---|---|---|---|---|---|
| $\eta_{new,y\ CH2300}$ | 6134 | 31.0% (mean); 3.1% (SD) | 95/10 | 7 | 9 |
| $\eta_{new,y\ M5000}$ | 847 | 29.0% (mean); 2.9% (SD) | 95/10 | 7 | 10 |
| $SOF_{CH2300}$ | 6134 | 90% | 95/10 | 43 | 60 |
| $SOF_{M5000}$ | 847 | 90% | 95/10 | 41 | 61 |
| $f_{old\ CH2300}$ | 5521 | 90% | 95/10 | 43 | 57 |
| $f_{old\ M5000}$ | 762 | 90% | 95/10 | 41 | 58 |
| $\mu_{old\ CH2300}$ | 552 | 450 kg (mean); 45.0 kg (SD) | 95/10 | 7 | 0 |
| $\mu_{old\ M5000}$ | 76 | 494 kg (mean); 49.4 kg (SD) | 95/10 | 7 | 8 |

It is noteworthy that $\mu_{old\ CH2300}$ is used to determine the usage of baseline stove along with ICS, if applicable, for discounting $B_{old}$ in line with para 20(b) of methodology AMS II.G. version 3.0/7/ . This parameter needs to be monitored only when the sampled users are found using baseline stoves along with ICS. In case of CH2300 all samples monitored were found using ICS only and no sample was found using baseline stove along with ICS. Hence the parameter $\mu_{old\ CH2300}$ has been considered not relevant for the concerned monitoring period by the PP. Initially the sample size for $\mu_{old\ CH2300}$ was calculated based on an initial assumption of $f_{old}$ as 10% (i.e. 10% pf users might be using baseline stove and ICS together). However, as the monitoring revealed that baseline stove users do not exist, the parameter is rendered redundant for the concerned monitoring period. Same was also verified during the sample site visit/32/ by the assessment team and found to be consistent with the information provided by the CME.

Data was collected for SOF, $f_{old}$ and $\mu_{old}$ following a specially design survey form/19/. As for the thermal efficiency of the stoves, water boiling tests were conducted using WBT protocol as given by GACC/20/. Refer ER calculator worksheet/11/ “Survey summary” and “WBT Summary” for details on data collected during monitoring. In this regard, sample size calculation spreadsheet /11/ was checked and found correct as per registered monitoring plan.

In the ER sheet, analysis of the data monitored through sampling revealed the following results:

| Parameter | Results | Unit |
|---|---|---|
| $\eta_{new,y\ CH2300}$ | 32.35 | % |
| $\eta_{new,y\ M5000}$ | 28.64 | % |
| $SOF_{CH2300}$ | 0.950 | fraction |
| $SOF_{M5000}$ | 0.951 | fraction |
| $f_{old\ -\ CH2300}$ | 0.000 | fraction |
| $f_{old\ -\ M5000}$ | 0.138 | fraction |
| $\mu_{old\ -\ CH2300}$ | 0.000 | kg / year |
| $\mu_{old\ -\ M5000}$ | 136.9 | kg / year |

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

| $\eta_{new,y\ CH2300}$ | 32.35% | Percentage | Calculated |
|---|---|---|---|
| total number of stoves | 6134 | Number | CPA Installation Databases |
| Samples monitored for ($\eta_{new\ CH2300}$) | 9 | Number | WBT data |
| Mean | 32.3% | percentage | Calculated |
| Standard Deviation | 1.15% | percentage | Calculated |
| Standard error of mean ($\eta_{new\ CH2300}$) | 0.38% | percentage | Calculated |
| Precision for $\eta_{new\ CH2300}$ | 2.31% | Percentage | Calculated |
| Result for $\eta_{new\ CH2300}$ | ok, acceptable | -- | Calculated |

| $\eta_{new,y\ M5000}$ | 28.64% | percentage | Calculated |
|---|---|---|---|
| total number of stoves | 847 | Number | CPA Installation Databases |
| Samples monitored for ($\eta_{new\ M5000}$) | 10 | Number | WBT data |
| Mean | 28.6% | percentage | Calculated |
| Standard Deviation | 0.72% | percentage | Calculated |
| Standard error of mean ($\eta_{new\ M5000}$) | 0.23% | percentage | Calculated |
| Precision for $\eta_{new\ M5000}$ | 1.55% | percentage | Calculated |
| Result for $\eta_{new\ M5000}$ | ok, acceptable | -- | Calculated |

| $SOF_{CH2300}$ | 0.950 | fraction | Calculated |
|---|---|---|---|
| Population Size | 6134 | number | CPA Installation Databases |
| Samples monitored | 60 | number | Calculated |
| Proportion for $SOF_{CH2300}$ | 0.950 | Fraction | Calculated |
| Standard error of proportion for $SOF_{CH2300}$ | 2.80% | percentage | Calculated |
| Precision for $SOF_{CH2300}$ | 5.78% | percentage | Calculated |
| Result for $SOF_{CH2300}$ | ok, acceptable | -- | Calculated |

| $SOF_{M5000}$ | 0.951 | fraction | Calculated |
|---|---|---|---|
| Population Size | 847 | number | CPA Installation Databases |
| Samples monitored | 61 | number | Calculated |
| Proportion for $SOF_{M5000}$ | 0.951 | Fraction | Calculated |
| Standard error of proportion for $SOF_{M5000}$ | 2.67% | percentage | Calculated |
| Precision for $SOF_{M5000}$ | 5.50% | percentage | Calculated |
| Result for $SOF_{M5000}$ | ok, acceptable | -- | Calculated |

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

| $f_{old\ CH2300}$ | 0.000 | fraction | Calculated |
|---|---|---|---|
| Population Size | 5827 | number | CPA Installation Databases |
| Samples monitored | 57 | number | Calculated |

| | | | |
|---|---|---|---|
| Porportion for $f_{non\ old\ CH2300}$ | 1.000 | tonnes/y | Calculated |
| Standard error of proportion for $f_{non\ old\ CH2300}$ | 0.00% | percentage | Calculated |
| Precision for $f_{non\ old\ CH2300}$ | 0.00% | percentage | Calculated |
| Result for $f_{non\ old\ CH2300}$ | ok, acceptable | -- | Calculated |

| **$f_{old\ M5000}$** | **0.138** | **Fraction** | **Calculated** |
|---|---|---|---|
| Population Size | 805 | Number | CPA Installation Databases |
| Samples monitored | 58 | Number | Calculated |
| Porportion for $f_{non\ old\ M5000}$ | 0.862 | tonnes/y | Calculated |
| Standard error of proportion for $f_{non\ old\ M5000}$ | 4.36% | percentage | Calculated |
| Precision for $f_{non\ old\ M5000}$ | 9.92% | percentage | Calculated |
| Result for $f_{non\ old\ M5000}$ | ok, acceptable | -- | Calculated |

| **$\mu_{old\ CH2300}$** | **0.000** | **tonnes/year** | **Calculated** |
|---|---|---|---|
| Population Size | 0 | Number | CPA Installation Databases |
| Samples monitored | 0 | Number | Calculated |
| Mean for $\mu_{old\ CH2300}$ | not applicable | tonnes/y | Calculated |
| Standard Deviation $\mu_{old\ CH2300}$ | not applicable | tonnes/y | Calculated |
| Standard error of mean $\mu_{old\ CH2300}$ | not applicable | percentage | Calculated |
| Precision for $\mu_{old\ CH2300}$ | not applicable | percentage | Calculated |
| Result for $\mu_{old\ CH2300}$ | not applicable | -- | Calculated |

| **$\mu_{old\ M5000}$** | **0.1369** | **tonnes/year** | **Calculated** |
|---|---|---|---|
| Population Size | 111 | Number | CPA Installation Databases |
| Samples monitored | 8 | Number | Calculated |
| Mean for $\mu_{old\ M5000}$ | 0.14 | tonnes/y | Calculated |
| Standard Deviation $\mu_{old\ M5000}$ | 0.02 | tonnes/y | Calculated |
| Standard error of mean $\mu_{old\ M5000}$ | 0.57% | percentage | Calculated |
| Precision for $\mu_{oldM5000}$ | 8.25% | percentage | Calculated |
| Result for $\mu_{old\ M5000}$ | ok, acceptable | -- | Calculated |

All parameters of interest included in the Sample Size Calculator spread sheet/11/ were checked for the input values as well as formula applied and were found consistent. The reliability (demonstration of precision achieved after the survey results) is depicted in the ER sheet /11/ corresponding to final Monitoring Report /9/, which were also found correct. Based on the verified results the verification team found that the required precision is met in all the cases and therefore the WBT / survey results /18/ were directly used in the calculation of ERs.

| | |
|---|---|
| **Findings** | CAR#05 & CAR#06 was raised and closed. |

| | |
|---|---|
| **Conclusion** | The verification team confirmed that the sampling plan and the parameter values are in accordance with the monitoring plan provided in PoA DD /01/. |

### I.5. Compliance with the calibration frequency requirements for measuring instruments

| | |
|---|---|
| **Means of verification** | Prior to carrying out the WBT the equipment were either newly purchased or wre under calibration –<br><br>Details of the equipment used for WBT are as provided below<br><br>**Equipment**<br>**Mini-thermometer:**<br>Brand: Omega<br>Model: Omegaette HH308 Type K<br>Accuracy: +/- 0.3% reading +1$^0$C<br>Number of units: 1<br>S/N:141203660<br>**Mass balance**<br>Brand: LW Measurements<br>Model: MCT-33 Plus<br>Accuracy: +/- 2 division, +/- 0.002 lbs<br>Number of units: 1<br>S/N: MCP1408033<br>**Moisture Meter**<br>Brand: Delmhorst<br>Model: J2000<br>Accuracy: +/- 0.2%<br>Number of units: 1<br>S/N: 38784<br><br>It is noteworthy that all the above equipment's are newly purchased equipment's and/or pre calibrated by the manufacturer as per the following information:<br><br>The assessment team has checked the user manual of the respective monitoring equipment's.<br><br>The moisture meter (Delmhorst J2000) has a calibration checking feature in-built into it. As per the manual/25/, once the calibration check button is pressed, the screen shall show a reading of 12.0. A value of 12.0 confirms that the meter is under calibration and good for use/31/. If the screen does not show a reading of 12.0 it must be sent to Delmhorst for re-calibration. The snapshot of the screen (showing a reading of 12.0) taken before the start of tests has been checked by the assessment team. Also, the reading of 12.0 was confirmed during the verification site visit.<br><br>The weighing scale (MCT-33 Plus) used has an in-built calibration software called as ANYCAL. The DoE confimed the same from the specification sheet for the weighting scale which mentions that the unit has an auto-calibration feature using ANYCAL software. The user manual has been checked by the assessment team to confirm the same.<br><br>The thermometer used for WBT (Omegaette HH308) is a new unit. The manufacturer factory calibration certificate/28/ submitted by the PP substantiates that the unit was pre-calibrated at the time of testing. The date of first use of this thermometer was 25 April 2016. Also, PP has provided a mail communication between the PP & the thermometer manufacturer where the manufacturer state in the mail that calibration of the thermometer is valid for one year after first use. Hence the calibration is deemed valid till 24 April 2017 (i.e. one year from date of first use).<br><br>Thus, the assessment team confirms that the measurements were done with necessary guarantees. |
| **Findings** | CAR#04 was raised and closed. |

| | |
|---|---|
| **Conclusion** | The verification team confirm that CME applied good practice by for data collection & sampling survey and the equipment's used by the third party for sample surveyed are duly calibrated. |

## I.6. Assessment of data and calculation of emission reductions or net removals

### I.6.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

| | |
|---|---|
| **Means of verification** | The verification team verified that<br>a) A complete set of data for the monitoring period was available for the monitoring period and the verification of each monitoring parameter is elaborated under Section I.4.2 of this report. The complete monitoring data is also presented in the corresponding ER calculations sheet /06/ of final Monitoring Report /04/.<br>b) The information provided in the monitoring report was cross checked with other sources, wherever appropriate and available, and such information is also included under Section I.4.2 of this report. .<br>c) The calculations of baseline emissions as presented in the corresponding ER calculations sheet /06/ of final Monitoring Report /04/ were checked and found to be consistent with the formulae and methods described in the registered monitoring plan of each relevant CPA-DD, PoA-DD and the applied methodology.<br>d) All assumptions used in the emission calculations were found appropriate and therefore justified<br>e) Appropriate emission factors, IPCC default factors and other reference values have been correctly applied. This has also been elaborated under Section I.4.1 of this report.<br>f) No standardized baseline was prescribed in the PoA DD and therefore it has not been applied.<br>g) There is no pro-rate approach (para 402(g) of CDM VVS Version 09) was applied in the current monitoring period as entire monitoring period falls into period that is after the end of first commitment period of Kyoto Protocol.<br><br>The following equations were used to determine the baseline emissions as provided in the monitoring report /04/ and applied in the corresponding ER calculations sheets /06/. The expressions used were found consistent with the revised PoA-DD, CPA-DDs and the applied methodology AMS-II.G, version 04:<br><br>Total ER reductions achieved for any CPA is calculated using the following expressions:<br>$$ER_y = B_{y,savings} \cdot f_{NRB} \cdot NCV_{biomass} \cdot EF_{projected\ fossil_{fuel}}$$<br>$$B_{y,savings} = B_{old} \cdot \left(1 - \frac{\eta_{old}}{\eta_{new}}\right)$$<br>$$B_{old} = LAF \cdot N_{all} \cdot SOF \cdot (Q_{biomass} - \left(\frac{\mu_{old}}{1000} \cdot f_{old}\right)) \cdot Stove_{year}$$<br>It has been verified that the corresponding ER calculations sheet /06/ to the final Monitoring Report /04/ has considered the number of stoves as per the vintage and accordingly the efficiency of such stoves in the ER calculation for relevant CPA. |
| **Findings** | CAR#07 & CAR#08 are raised and closed. |
| **Conclusion** | The verification team confirms that<br>a) The complete data was available and is duly reported;<br>b) As indicated above, the description with regard to cross-check of reported data is included under respective parameter (refer Section I.4.2 of this report);<br>c) Appropriate methods and formulae for calculating baseline GHG emissions or baseline net GHG removals were followed;<br>d) Appropriate emission factors, IPCC default factors and other reference values were correctly applied.<br>e) There is no pro-rate approach (para 403(e) of CDM VVS Version 09) was |

| | |
|---|---|
| | applied in the current monitoring period as entire monitoring period falls into period that is after the end of first commitment period of Kyoto Protocol. |

### I.6.2. Calculation of project GHG emissions or actual net GHG removals by sinks

| | |
|---|---|
| **Means of verification** | The PoA DD, CPA DD and applied monitoring methodology does not prescribe any project emissions to be considered. The onsite visit and project design also did not reveal any potential source to be considered in this regard. |
| **Findings** | No finding was raised. |
| **Conclusion** | No project emissions were required to be calculated. |

### I.6.3. Calculation of leakage GHG emissions

| | |
|---|---|
| **Means of verification** | The PoA DD, CPA DD and applied monitoring methodology does not prescribe any leakage emissions to be considered. The onsite visit and project design also did not reveal any potential source to be considered in this regard. However, the leakage adjustment factor that is required to adjust the baseline emissions has been duly accounted in baseline calculations. |
| **Findings** | No finding was raised. |
| **Conclusion** | No additional leakage emissions (other than what is already considered in baseline calculations) were required in accordance with the methodology AMS-II.G, version 04 /03/. |

### I.6.4. Summary of calculation of GHG emission reductions or net GHG removals by sinks

| | |
|---|---|
| **Means of verification** | As discussed in the above sections, the entire emission reductions from the PoA were based on baseline emissions. The calculations presented in this regard in the final monitoring report /04/ and corresponding ER calculations sheet /06/ were found appropriate and complying with the provisions prescribed in the registered monitoring plan of respective CPA-DD, PoA-DD and applied methodology.<br>The verification team confirms that an audit trail that contains the evidence and records that validated the stated figures were checked and found acceptable. |
| **Findings** | No finding was raised. |
| **Conclusion** | The verification team confirms that<br>a) The complete data was available and is duly reported;<br>b) As indicated above, the description with regard to cross-check of reported data is included under respective parameter (refer Section I.4.2 of this report);<br>c) Appropriate methods and formulae for calculating baseline GHG emissions or baseline net GHG removals, project emissions and leakage emissions were followed;<br>d) Appropriate emission factors, IPCC default factors and other reference values were correctly applied.<br>e) There is no pro-rata approach (para 403(e) of CDM VVS Version 09) was applied in the current monitoring period as entire monitoring period falls into period that is after the end of first commitment period of Kyoto Protocol.<br>The total number of ERs achieved during the current monitoring period (for ICS only) is 20,040t$CO_2$e. |

| Specific-case CPA reference number | Baseline emissions or baseline net GHG removals by sinks ($tCO_2e$) | Project emissions or actual net GHG removals by sinks ($tCO_2e$) | Leakage ($tCO_2e$) | GHG emission reductions or net GHG removals by sinks ($tCO_2e$) | | |
|---|---|---|---|---|---|---|
| | | | | Results achieved in the period up to 31 December 2012 | Results achieved in the period from 1 January 2013 onwards | Results achieved in the entire monitoring period |
| 5342-0004 | 2,423 | 0 | 0 | 0 | 2,423 | 2,423 |
| 5342-0005 | 17,617 | 0 | 0 | 0 | 17,617 | 17,617 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Total** | **20,040** | **0** | **0** | **0** | **20,040** | **20,040** |

### I.6.5. Comparison of actual GHG emission reductions or net GHG removals by sinks with estimates in included specific-case CPA

| | |
|---|---|
| **Means of verification** | As verified from the final Monitoring Report /04/ and corresponding ER calculations sheet /06/, the actual emission reductions achieved by each CPA that is included in the current monitoring period were found less than the estimated quantity in the CPA-DD for the comparable period. |
| **Findings** | No finding was raised. |
| **Conclusion** | The actual emission reductions achieved in specific CPA are not higher than the estimated quantity of ERs in the respective CPA-DD. It was accepted by the verification team. |

| Specific-case CPA reference number | Value estimated in ex ante calculation in the included specific-case CPA-DD(s) | Actual values achieved by the specific-case CPA(s) during this monitoring period |
|---|---|---|
| 5342-0004 | 44,159 | 2,423 |
| 5342-0005 | 44,159 | 17,617 |
| **Total** | **88,318** | **20,040** |

### I.6.6. Remarks on difference from estimated value in registered PDD

| | |
|---|---|
| **Means of verification** | The achieved emission reduction are way less than the estimated ones. Thus no further explanation was sought by assessment team and thereby accepted. |
| **Findings** | No finding was raised. |
| **Conclusion** | The achieved ERs are less than the estimated amount. |

# Appendix 1. Abbreviations

| Abbreviations | Full texts |
|---|---|
| AQL | Acceptable Quality Level |
| CAR | Corrective Action Request |
| CDM | Clean Development Mechanism17, |
| CDM PCP | Clean Development Mechanism Project Cycle Procedure |
| CDM PS | Clean Development Mechanism Project Standard |
| CDM VVS | Clean Development Mechanism Validation and Verification Standard |
| CER | Certified Emission Reduction |
| CEP | Clean Energy Product |
| CL | Clarification Request |
| CME | Coordinating or Managing Entity |
| CPA | Component Project Activity |
| CP | Crediting period |
| DOE | Designated Operational Entity |
| DNA | Designated National Authority |
| EB | Executive Board |
| ESPL | Earthood Services Private Limited |
| FAR | Forward Action Request |
| GHG | Greenhouse Gas(es) |
| ICS | Improved Cook Stove |
| IPCC | Intergovernmental Panel on Climate Change |
| PDD | Project Design Document |
| RMP | Registered monitoring plan |
| TA | Technical Area (with in Sectoral Scope) |
| TR | Technical Reviewer |
| VVS | Validation and Verification Standard |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UQL | Unacceptable Quality Level |
| ICS | Improve Cook Stoves |
| IPCC | Inter governmental Panel on Climate change |
| VVS | Validation and Verification Standard |
| UNFCCC | United Nation Framework convention on Climate change |
| WBT | Water Boiling Test |
| GACC | Global Alliance for  Clean Cookstoves |
| EPTP | Stove Manufacturers Emissions and Performance Test Protocol |

# Appendix 2. Competence of team members and technical reviewers

| Competence Statement | | | |
|---|---|---|---|
| **Name** | Nayan Jyoti Deka | | |
| **Country** | India | | |
| **Education** | M.Tech. (Energy Technology), Tezpur University | | |
| **Experience** | 8 Years + | | |
| **Field** | Climate Change & Energy Management | | |
| **Approved Roles** | | | |
| **Team Leader** | YES | | |
| **Validator** | YES | | |
| **Verifier** | YES | | |
| **Methodology Expert** | AMS-I.D., AMS-III.H., AMS-I.C., ACM0006, ACM0002, | | |
| **Local expert** | YES (India) | | |
| **Financial Expert** | NO | | |
| **Technical Reviewer** | YES | | |
| **TA Expert (1.1, 1.2, 3.1, 13.1)** | YES | | |
| | | | |
| **Reviewed by** | Abhishek Mahawar | **Date** | 08/09/2016 |
| **Approved by** | Ashok Kumar Gautam | **Date** | 08/09/2016 |

| Competence Statement | | | |
|---|---|---|---|
| **Name** | Anshika Gupta | | |
| **Country** | India | | |
| **Education** | M.Sc. (Climate Science & Policy), TERI University | | |
| **Experience** | 2 Year + | | |
| **Field** | Climate Change | | |
| **Approved Roles** | | | |
| **Team Leader** | YES | | |
| **Validator** | YES | | |
| **Verifier** | YES | | |
| **Methodology Expert** | AMS-I.A., AMS-II.G., ACM0002, AMS-III.A.V. | | |
| **Local expert** | YES (India) | | |
| **Financial Expert** | NO | | |
| **Technical Reviewer** | NO | | |
| **TA Expert (1.2, 3.1)** | NO | | |
| | | | |
| **Reviewed by** | Abhishek Mahawar | **Date** | 08/09/2016 |
| **Approved by** | Ashok Kumar Gautam | **Date** | 08/09/2016 |

| Competence Statement | | | |
|---|---|---|---|
| **Name** | Ms. Adeola Ijeoma Eleri | | |
| **Country** | Nigeria | | |
| **Education** | Certificate in Energy and Sustainable Development (IIIEE, Sweden)<br>M.Sc. (Environmental Biology)<br>B.Sc. (Microbiology) | | |
| **Experience** | 8 Years | | |
| **Field** | Climate Change, Energy & Environment | | |
| **Approved Roles** | | | |
| **Team Leader** | NO | | |
| **Validator** | NO | | |
| **Verifier** | NO | | |
| **Methodology Expert** | NO | | |
| **Local expert** | YES (Nigeria) | | |
| **Financial Expert** | NO | | |
| **Technical Reviewer** | NO | | |
| **TA Expert** | NO | | |
| **Reviewed by** | Abhishek Mahawar | **Date** | 07/09/2016 |
| **Approved by** | Ashok Kumar Gautam | **Date** | 07/09/2016 |

| Competence Statement | | | |
|---|---|---|---|
| **Name** | Kaviraj Singh | | |
| **Country** | India | | |
| **Education** | Ph.D. (Environmental Engineering), IIT Delhi<br>M.Phil. (Energy & Environmental), DAVV Indore | | |
| **Experience** | 9 Years + | | |
| **Field** | Climate Change & Environment | | |
| **Approved Roles** | | | |
| **Team Leader** | YES | | |
| **Validator** | YES | | |
| **Verifier** | YES | | |
| **Methodology Expert** | AMS-I.D., AMS-II.D., ACM0006, AMS-I.A., AMS-I.C., AMS-II.B., AMS-III.H, ACM0002, ACM0001 | | |
| **Local expert** | YES (India) | | |
| **Financial Expert** | NO | | |
| **Technical Reviewer** | YES | | |
| **TA Expert (1.1)** | YES | | |
| **TA Expert (1.2)** | YES | | |
| **TA Expert (13.1)** | YES | | |
| **TA Expert (13.2)** | YES | | |
| **TA Expert (15.2)** | YES | | |
| **Reviewed by** | Abhishek Mahawar | **Date** | 08/09/2016 |
| **Approved by** | Ashok Gautam | **Date** | 08/09/2016 |

| Competence Statement | |
|---|---|
| **Name** | Ashok Gautam |
| **Country** | India |
| **Education** | M. Sc. (Environmental Sciences)<br>M. Tech. (Energy & Environmental Management) |

| | | | |
|---|---|---|---|
| **Experience** | 14 Years + | | |
| **Field** | Energy, Climate Change & Environment | | |
| **Approved Roles** | | | |
| **Team Leader** | YES | | |
| **Validator** | YES | | |
| **Verifier** | YES | | |
| **Methodology Expert** | AMS-I.D., AMS-I.A., AMS-I.C. AMS-II.D., AMS-II.G., AMS-III.E., AMS-III.H., AMS-III.Z., AMS-III.AV., AM0029, AM0025, AM0056, ACM0001, ACM0002, ACM0004, ACM0006 | | |
| **Local expert** | YES (India) | | |
| **Financial Expert** | NO | | |
| **Technical Reviewer** | YES | | |
| **TA Expert (1.1)** | YES | | |
| **TA Expert (1.2)** | YES | | |
| **TA Expert (3.1)** | YES | | |
| **TA Expert (13.1)** | YES | | |
| | | | |
| **Reviewed by** | Abhishek Mahawar | **Date** | 08/09/2016 |
| **Approved by** | Kaviraj Singh | **Date** | 08/09/2016 |

# Appendix 3. Documents reviewed or referenced

| No. | Author | Title | References to the document | Provider |
|---|---|---|---|---|
| 1 | CME | PoA DD | Version 4.3, dated – 07/06/2014 | Other |
| 2 | UNFCCC | Validation report | Version -11, dated – 05/12/2012 | Other |
| 3 | CME | CPA DD – 5342 -0004 | Version – 6.1, dated – 11/09/2014 | Other |
| 4 | CME | CPA DD – 5342 - 0005 | Version – 6.1, dated – 11/09/2014 | Other |
| 5 | UNFCCC | CPA #4 validation report | Version -04, dated – 23/09/2014 | Other |
| 6 | UNFCCC | CPA #5 validation report | Version -04, dated – 23/09/2014 | Other |
| 7 | UNFCCC | Methodology AMS II G, | version 05 | Other |
| 8 | CME | Monitoring report (Publication) | Version – 1, dated – 15/09/2016 | CME |
| 9 | CME | Monitoring report (Final version) | Version -2.2, dated – 27/01/2017 | CME |
| 10 | CME | ER calculation sheet (Initial) | Pertaining to initial MR | CME |
| 11 | CME | ER calculation sheet (Final) | Pertaining to final MR | CME |
| 12 | IPCC | IPCC Defaults | 2006 | Other |
| 13 | UNFCCC | CDM VVS | Version 09 | Other |
| 14 | UNFCCC | CDM PS | Version 09 | Others |
| 15 | UNFCCC | CDM PCP | Version 09 | Others |
| 16 | UNFCCC | Standard: Sampling and surveys for CDM project activities and programme of activities | 5.0 | Others |

| | | | | |
|---|---|---|---|---|
| 17 | UNFCCC | Guideline: Sampling and surveys for CDM project activities and programme of activities | 4.0 | Others |
| 18 | CME | Monitoring Survey Records | - | CME |
| 19 | CME | Nigeria Monitoring Survey Questionnaire template | - | CME |
| 20 | EPTP | WBT Test Protocol (Stove Manufacturers Emissions and Performance Test Protocol) | - | CME |
| 21 | CME | WBT Sheets - M5000 | - | CME |
| 22 | CME | WBT Sheets - CH2300 | - | CME |
| 23 | CME | ICS CH2300 Spec Sheet | - | CME |
| 24 | CME | ICS M5000 Spec Sheet | - | CME |
| 25 | Delmhorst | Delmhorst J2000 moisture meter manual | - | CME |
| 26 | Omega Engineering | Thermometer Omega - HH307_308 pre-calibration NIST Certificate | - | CME |
| 27 | Omega Engineering | Email - Nigeria Verification Calibration for HH308 from Manufacturer | - | CME |
| 28 | H & C Weighing systems | Weighing scale LW measurements MCT plus 33 specifications - auto calibration | - | CME |
| 29 | CME | Monitoring Survey Training Presentation | - | CME |
| 30 | CME | Carbon Waiver 3 - CPA Distribution Record | - | CME |
| 31 | CME | Snap shot of Scale showing reading showing feed of 12 | - | CME |
| 32 | CME | DOE filed survey report | - | Other |
| 33 | UK govt. | https://www.gov.uk/foreign-travel-advice/nigeria | - | Other |
| 34 | US govt. | https://travel.state.gov/content/passports/en/alertswarnings/nigeria-travel-warning.html | - | Other |

# Appendix 4. Clarification requests, corrective action requests and forward action requests

**Table 1. Remaining FAR from validation and/or previous verification**

*There is no finding from validation /02/.*

**Table 2. CL from this verification**

| **CL ID** | 01 | **Section no.** | H.1 | **Date :** 02/11/2016 |
|---|---|---|---|---|
| **Description of CL** | | | | |
| PP is requested to kindly provide the following documents –<br>1. All the calibration certificates of the equipment's used in the WBT<br>2. Copies of the Sample survey questionnaire<br>3. Evidence for carbon waiver form<br>4. Evidence for training and QA/QC for data management<br>5. Technical specifications if ICS<br>6. Copy of the raw data used in the WBT | | | | |
| **Project participant response** | | | | **Date :** 02/11/2016 |
| The requested documents are being submitted. | | | | |
| **Documentation provided by project participant** | | | | |
| 1. Details of the equipment's used in the WBT and their calibration status<br>2. Survey questionnaire template and survey records for all samples<br>3. Evidence for carbon waiver form<br>4. Evidence for training and QA/QC for data management<br>5. Technical specifications of ICS<br>6. WBT data recording template and the test records | | | | |
| **DOE assessment** | | | | **Date:** 11/11/2016 |
| PP has provided all the required documents which has been reviewed and checked and found to be satisfactory. Thus CL#01 was closed. | | | | |

**Table 3. CAR from this verification**

| **CAR ID** | 02 | **Section no.** | H.2 | **Date :** 02/11/2016 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| *PP is requested to kindly clarify the following issues observed in the MR –*<br>1. *Page 10 of MR* - It is not clear, how the date of 1st stove sale is prior to the CPA start date for CPA 5342-0004. Please clarify.<br>2. *Page 11 of MR* - ERs for CPA0004 & CPA0005 are inconsistent with the ER sheet as well as the total ERs. Please correct it.<br>3. *Page 16 of MR* - The value of M5000 for $\mu_{old}$ is not consistent with the ER sheet. | | | | |
| **Project participant response** | | | | **Date :** 02/11/2016 |
| 1. Page 10 of MR – The year was wrongly mentioned as 2012 instead of 2013 on account of typographical error. The MR has been revised to mention the date of 1st stove sale correctly as.<br>2. Page 11 of MR - ERs for CPA0004 & CPA0005 have been made consistent with the ER calculator, in the revised MR.<br>3. Page 16 of MR - The value of M5000 for $\mu_{old}$ has been corrects in the MR as per the ER calculator | | | | |
| **Documentation provided by project participant** | | | | |
| *Nigeria MP#1 MR version 2.0 02112016* | | | | |
| **DOE assessment** | | | | **Date:** 11/11/2016 |
| PP has revised the MR and has addressed all the raised issues satisfactory. Thus CAR#02 was closed. | | | | |

| **CAR ID** | 03 | **Section no.** | I.4.1.1 | **Date :** 02/11/2016 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| *PP is requested to kindly clarify the following issues observed in the MR –*<br>1. *Page 12 of MR – Many information in the table for ex ante parameter under section G.1,are either incomplete or inconsistent w.r.t the CPA-DD.*<br>2. *Page 14 of MR* - Kindly also mentioned the respective CPA number for all the value of the monitored parameters. | | | | |
| **Project participant response** | | | | **Date :** 02/11/2016 |
| 1. Page 12 of MR – Tables for ex ante parameters under section G.1 have been revised to be consistent with registered CPA-DD for 5342-0004 and 5342-0005.<br>2. Page 14 of MR – The monitoring parameter values and the corresponding CPA to which it is applicable has been mentioned in section G.2 for all the parameters in revised MR | | | | |
| **Documentation provided by project participant** | | | | |
| *Nigeria MP#1 MR version 2.0 02112016* | | | | |
| **DOE assessment** | | | | **Date:** 11/11/2016 |
| PP has revised the MR and has addressed all the raised issues satisfactory. Thus CAR#03 was closed. | | | | |

| **CAR ID** | 04 | **Section no.** | I.4.2.1 & I.5 | **Date :** 02/11/2016 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| *PP is requested to kindly clarify the following issues observed in the MR –*<br>1. *Page 14 of MR* - PP is requested to kindly indicate the date of calibration of the meters and their validity. Even if the equipments are newly purchased, PP should provide the manufacturer's test certificate or calibration details of the equipment's.<br>2. *Page 14 of MR* - PP should also provide information whether the WBT is carried out in controlled condition i.e. Lab or at the user premises.<br>3. *Page 14 of MR* -Why the PP has not indicated which version of WBT protocol is used in WBT analysis.<br>4. *Page 14 of MR* - As per the CPA DD "*Water Boiling Tests undertaken under the supervision of CME/DO will follow the requirements of the "Stove Manufacturers Emissions & Performance Test Protocol" developed with contributions of Colorado State University's Engines & Energy Conversion Lab. The protocol will be made available to the DOE*." So please clarify how this requirement is met. | | | | |
| **Project participant response** | | | | **Date :** 02/11/2016 |

1. The moisture meter (Delmhorst J2000) has a calibration checking feature in-built into it. As per the manual, once the calibration check button is pressed, the screen shall show a reading of 12.0. A value of 12.0 confirms that the meter is under calibration and good for use. If the screen does not show a reading of 12.0 it must be sent to Delmhorst for re-calibration. The snapshot of the screen (showing a reading of 12.0) taken before the start of tests has been shared with the DoE. Also, the reading of 12.0 was confirmed during the verification site visit as well substantiating the meter to be under calibration during the monitoring activity.

   Similarly, the MCT-33 Plus weighing scale used has an in-built calibration software called as ANYCAL. The specification sheet for the weighting scale mentions that the unit has an auto-calibration feature using ANYCAL software.

   The thermometer used for WBT (Omegaette HH308) is a new unit. The manufacturer factory calibration certificate is being submitted substantiating that the unit was pre-calibrated at the time of testing. The date of first use of this thermometer was 25 April 2016. The manufacturer recommends a standard calibration frequency of once a year. Hence the calibration is deemed valid till 24 April 2017 (i.e. one year from date of first use)

2. The WBTs were conducted in the Envirofit Nigeria office to ensure standard testing environment across all units being tested.
3. The protocol used for conducting WBT is Stove Manufacturers Emissions & Performance Test Protocol as specified in the CPA-DDs. The protocol is being submitted.
4. Please refer above.

| **Documentation provided by project participant** | |
|---|---|
| *Nigeria MP#1 MR version 2.0 02112016* | |
| **DOE assessment** | **Date:** 11/11/2016 |
| PP has revised the MR and has addressed all the raised issues satisfactory. Thus CAR#04 was closed. | |

| **CAR ID** | 05 | **Section no.** | I.4 | **Date :** 02/11/2016 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| *PP is requested to kindly clarify the following issues observed in the MR –*<br>*1. Page 5 of MR – PP is requested to kindly include all the formulas used in the sampling calculation*<br>*2. Page 6 of MR - It is not clear why PP has not monitored any samples for the monitored parameter µold $_{CH2300}$ , whereas as the table mentioned that "Required sample size" is 7 ? On what basis PP has avoided doing the sampling even if the required sample size comes out to be 7.*<br>*3. Page 5 of MR - Inconsistency is observed in the "Expected result" for the parameters* $\eta_{new\ CH2300}$ *&* $\eta_{new\ M5000}$ *with respect to the ER sheet. Also, how the "expected result" for* $SOF_{M5000}$ *is arrived is not clear.*<br>4. *Page 7 of MR* - Why the population size & sample size are zero for the parameter $\mu_{old\ CH2300}$, since in the ER sheet the population size is mentioned as 552. Also, how the sample size is zero since as per the t distribution the required sample size comes out to be 7. | | | | |
| **Project participant response** | | | | **Date :** 02/11/2016 |

1. MR has been revised to refer to the equations used for sampling as per sampling guidelines.
2. *µold $_{CH2300}$* is used to determine the usage of baseline stove along with ICS. This parameter is to be monitored only when the sampled users are found using baseline stoves along with ICS. In case of CH2300 all samples were found using ICS only and no sample was found using baseline stove. Hence this parameter is not relevant and need not be monitored. The same had been mentioned in the footnote in MR. Initially the sample size for *µold$_{CH2300}$* was calculated based on an initial assumption of $f_{old}$ as 10% and $\mu_{old}$ as 450kg/year. However, this was deemed not applicable since no users using both stoves were found. If the expected value of parameter $f_{old}$ is taken as zero for sample size calculations, the sample size for $\mu_{old\ CH2300}$ will automatically become zero.
3. The inconsistency in the MR has been revised. The expected values are based on PP's experience and knowledge as per para 12(b) and 12(c) of the Standard: Sampling and surveys for CDM project activities and programmes of activities", Version 05.0
4. As explained above, the population size of 552 for sample size calculation of $\mu_{old\ CH2300}$ is based on the expected value of SoF as 90% and $f_{old}$ as 10% ($f_{non\ old}$ = 90%). The total population size i.e. $N_{all\ CH2300}$ is 6134. As the expected value of SoF was deemed 90% hence, the deemed stove population for $f_{old}$ became 5521 (= 6134 * 0.9) as only for those users using ICS are eligible for monitoring of $f_{old}$. Similarly, expected value of $f_{old}$ was deemed 10% hence, the deemed stove population for $\mu_{old}$ became 552 (= 5521 * 0.1) as only those users using both baseline stove and ICS are eligible for monitoring of $\mu_{old.}$ These values are applicable only to sample size calculations. After ex-post monitoring, the value of $f_{old}$ was found as 0 for charcoal stoves. As $f_{old}$ is zero, hence the population of users using both ICS and baseline stove for monitoring of $\mu_{old}$ for charcoal automatically becomes zero.

**Documentation provided by project participant**

*Nigeria MP#1 MR version 2.0 02112016*

| **DOE assessment** | **Date:** 11/11/2016 |
|---|---|
| PP has revised the MR and has addressed all the raised issues satisfactory. Thus CAR#05 was closed. | |

| **CAR ID** | 06 | **Section No.** | I.6 | **Date :** 02/11/2016 |
|---|---|---|---|---|

**Description of CAR**

*PP is requested to kindly address the following issues observed in the ER sheet –*

1. *The demonstration of precision for SOF for CH2300 & M5000 are not found in the ER sheet.*
2. *The demonstration of precision for fold for CH2300 & M5000 is not found in the ER sheet*

| **Project participant response** | **Date :** 02/11/2016 |
|---|---|

1. The precision for **SOF** for CH2300 & M5000 is represented in worksheet "Survey Summary" in cell C131 and J 131 respectively.
2. The demonstration of precision for **$f_{old}$** for CH2300 & M5000 is represented in worksheet "Survey Summary" in cell C139 and J 139 respectively.

**Documentation provided by project participant**

| **DOE assessment** | **Date:** 11/11/2016 |
|---|---|
| PP and has addressed all the raised issues satisfactory. Thus CAR#06 was closed. | |

| **CAR ID** | 07 | **Section no.** | I.6.1 | **Date :** 02/11/2016 |
|---|---|---|---|---|

**Description of CAR**

1. *Page 18 of MR* - PP is requested to kindly justify the appropriateness & correctness of the equation for Bold, since this equation is not mentioned in the applied methodology AMS IIG version 3.

| **Project participant response** | **Date :** 02/11/2016 |
|---|---|

The equation for $B_{old}$ is based on registered PoA and CPA-DD and in line with the provisions in the methodology as follows:

1. Para 7(a) of methodology has been used to determine $B_{old}$. In the equation on page 18 this is represented by $Q_{biomass}$ (i.e. estimated average annual consumption of woody biomass per appliance) * $N_{all}$ (i.e. number of systems) * SoF (i.e. % of systems that are found operating on a sampling basis).
2. The application of SoF is in line with para 16 of the methodology which requires determination of operational status of project systems on sampling basis.
3. The methodology further requires adjusting $B_{old}$ for leakage (para 13 (a) of methodology) Parameter LAF in the equation on page 18 accounts for Leakage
4. Besides, para 20 (b) requires to account for use of fuel wood consumption of baseline stoves (paragraph 20(b)) and adjust $B_{old}$ accordingly. Thus, the parameters $f_{old}$ and $\mu_{old}$ account for usage of fuelwood consumption in the baseline stoves in the concerned equation.
5. The parameter $Stove_{year}$ adjusts $B_{old}$ to average year fraction of the stoves under the monitoring period. This ensures that the progressive stoves sales are being credited only for that part of year for which overlaps with the concerned monitoring period.

Thus, the equation is in full compliance with the approved methodology and the registered PoA and CPA-DDs.

**Documentation provided by project participant**

| **DOE assessment** | **Date:** 11/11/2016 |
|---|---|
| PP has addressed all the raised issues satisfactory. Thus CAR#07 was closed. | |

| **CAR ID** | 08 | **Section no.** | I.6. | **Date :** 24/11/2016 |
|---|---|---|---|---|

**Description of CAR**

1. A discussion on the competence of the staff and its training for conducting survey etc. is not found in the MR. Please clarify
2. Column AB of Survey Summary worksheet calculated the 'Baseline Stove Usage Fraction' which is a unit-less value. However, in cell I145, the average of the same values is reported as 'Mean value of $\mu_{old}$' which has a unit of tonnes per annum. A clarification on the above calculation is required.
3. The Cells (M4977-5387) for the period ($25^{th}$ Oct 2014 – $31^{st}$ Dec 2014) in Distribution Data sheets show the value of fraction of year as 1.00. However the true value of the fraction will vary from 0.81 to 1.00 during this period which is not reflected by the formula. Please explain the formula and its compliance with the methodology.
4. Since the formula for t distribution is not provided by UN, please report the source of the formula in excel sheet and its verification.

**Project participant response** **Date :** 25/11/2016

1. Information on the competence of the staff and its training for conducting survey has been included in page 7, section B.2 the revised MR.
2. The calculated values in column AB are also in units of tonnes/annum. The column header mentioned this as fraction as a typographical error. The column header has been revised to mention the units as tonnes/year.
3. The error in the applied formulae has been revised. Now the year fraction for the period 25 Oct 2014 – 31 Dec 2014 varies accordingly in stove year calculations.
4. The use of t-distribution formula is in line with paragraph 13 of the Standard: Sampling and surveys for CDM project activities and programmes of activities, version 5.0. The formula used for adjusted sample size calculation is similar to that specified on page 5 of the monitoring report, however instead of z value constant, student distribution t-constant (for the given confidence) has been used as follows:

$$n = \frac{t^2 \cdot N \cdot V}{(N-1) \cdot c^2 + t^2 \cdot V}$$

where t = Student's t-distribution constant at given confidence level. All other parameters remain same as specified on page 5 of MR. The parameters used to determine the t-constant are confidence level and degrees of freedom. The confidence level has been taken as 95%. The degrees of freedom is equal to (n-1) where n is the sample size arrived at using equation in page 5 of MR (less than 30). The sample size is iterated unless the sample size value becomes stable and equal to that arrived in preceding iterations. Refer ER calculator for more details.

**Documentation provided by project participant**

*Revised ER calculator ver 2.1 25112016*
*Revised MR ver 2.1 25112016*

| **DOE assessment** | **Date:** 11/12/2016 |
|---|---|

| |
|---|
| PP has made the necessary corrections in the revised MR & ER sheet. The revised documents are checked and found to be satisfactory by the assessment team. Thus CAR#08 was closed. |

**Table 4. FAR from this verification**

There is no FAR from this verification.

- - - - -

## Document information

| *Version* | *Date* | *Description* |
|---|---|---|
| 01.0 | 5 June 2015 | Initial publication. |

Decision Class: Regulatory
Document Type: Form
Business Function: Issuance
Keywords: programme of activities, verifying and certifying