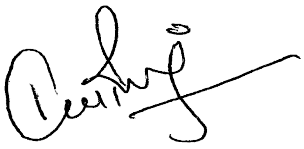
**Verification and certification report form for CDM programme of activities**

**(version 02.0)**

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

| BASIC INFORMATION | | |
|---|---|---|
| **Title and UNFCCC reference number of the programme of activities (PoA)** | African Improved Cooking Stoves Programme of Activities (5342) | |
| **Version number(s) of the PoA-DD(s) to which this report applies** | 4.3 | |
| **Version number of the verification and certification report** | 2.2 | |
| **Completion date of the verification and certification report** | 24/01/2019 | |
| **Monitoring period number and duration of this morning period** | Fifth Monitoring Period<br>25/10/2016 - 24/10/2017 | |
| **Number and version number of the monitoring report to which this report applies** | Monitoring report number: 1.0<br>Monitoring report version: 4.0 | |
| **Coordinating/managing entity (CME)** | Envirofit International Ltd. | |
| **Host Parties** | Host Parties of the PoA | Is this a host Party to a CPA covered in this report? (yes/no) |
| | Ghana<br>Nigeria<br>Liberia | No<br>Yes<br>No |
| **Applied methodologies and standardized baselines** | AMS-II.G Ver 3.0: Energy efficiency measures in thermal applications of non-renewable biomass | |
| **Mandatory sectoral scopes linked to the applied methodologies** | Sectoral scope: 3: Energy demand | |
| **Conditional sectoral scopes linked to the applied methodologies, if applicable** | NA | |
| **Estimated amount of GHG emission reductions or GHG removals for this monitoring period in the included CPAs covered in this report** | 88,318 $tCO_2e$ | |
| **Certified amount of GHG emission reductions or GHG removals for this monitoring period for the included CPAs covered in this report** | 11,791 $tCO_2e$ | |

| | |
|---|---|
| **Name and UNFCCC reference number of the 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 registered PoA under verification involves distribution of improved cook stoves (ICS) in the regions of Ghana, Nigeria and Liberia. The ICS are biomass fuel 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 ICS distribution is done 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 fire and equivalent). It has been replaced with the efficient improved cook stoves (ICS) which combust the fuel (wood or charcoal, wood fuel based traditional stoves being replaced by wood-fuel based ICS (M5000) and charcoal-fuel based traditional stoves being replaced by charcoal ICS (CH2300 and CH5300)) 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.

There are 6 CPAs viz., 5342-0001, 5342-0002, 5342-0003, 5342-0004, 5342-0005 and 5342-0006 included under the registered PoA. However, this request of issuance has been submitted only for two CPAs in Nigeria viz., 5342-0004 and 5342-0005. The current verification consists of two CPAs; 5342-0004 and 5342-0005 that are located 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 revised accepted PoA-DD/1/ & registered CPA-DDs/3,4/ 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:

(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) for PoA version 1.0
(v) The CDM Project Standard (PS) for PoA version 1.0
(vi) Project Cycle Procedure (PCP) for PoA version 1.0
(vii) 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 D.1 of this report) of Monitoring Report and corresponding ER sheet by verification team and planning of onsite audit (including sampling approach (refer Section D.4 of this report) to be applied)
e) On site audit (refer Section D.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 D.3 of this report)

g) Reporting and closure of findings (CARs/CLs/FARs) and preparation of draft verification report (refer Section D.5 of this report)
h) Independent technical review (refer Section F 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 D.5 of this report) (CARs/CLs/FARs) and final approval for the decision made (refer Section G and H 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 (Batch 01 consisting of 5342-0004 and 5342-0005) for the monitoring period 25/10/2016 - 24/10/2017 (including both dates) ESPL confirms 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 4.0. The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology AMS II.G Version 03/7/ and the monitoring plan contained in the revised accepted PoA-DD/1/.

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 25/10/2016 - 24/10/2017 (including both dates) amount to 11,791 $tCO_2e$. 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/document review | On-site inspection | Interview(s) | Verification findings |
| 1. | Team Leader | IR | Mahala | Deepika | Central office | Y | Y | Y | Y |
| 2. | Verifier | IR | Mahala | Deepika | Central office | Y | Y | Y | Y |
| 3. | Methodological Expert (AMS-II.G.) | IR | Mahala | Deepika | Central office | Y | Y | Y | Y |
| 4. | Technical Expert (TA 3.1) | IR | Mahala | Deepika | Central office | Y | Y | Y | Y |
| 5. | Trainee Verifier | IR | Guleria | Shifali | Central office | Y | N | N | Y |
| 6. | Local Expert | EI | Eleri | Adeola Ijeoma | 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 | Garg | Shreya | Central Office |
| 2. | TE to TR | IR | Garg | Shreya | Central Office |
| 3. | Approver | **IR** | Singh | Kaviraj | Central Office |

## SECTION C. Application of materiality in conducting the verification

### C.1. Consideration of materiality in planning the verification

| No. | Risk that could lead to material errors, omissions or misstatements | Assessment of the risk | | Response to the risk in the verification plan and/or sampling plan |
|---|---|---|---|---|
| | | Risk level | Justification | |
| 1. | Observational error by monitoring survey staff of CME/CPA implementer while recording the responses of users in relation to survey parameters | Med | There may be lack of experience.<br>The survey is conducted for representative samples of population, which may impact the population significantly. | Verification team randomly selected the samples from CME surveyed households. The recorded survey forms by CME were checked with DOE's field observations. |
| 2. | Transfer of recorded data into ER spreadsheets | Med | The process is manual and therefore there is potential risk of errors / omissions/misstatements. | All recorded data (monitoring survey and thermal efficiency) were checked with ER sheet/11/ for consistency of information. |
| 3. | Calculation Errors | Med | The process in manual and therefore there is potential risk of errors / omissions/misstatements. | All calculations/formulas were checked by verification team with respect to applicable requirements under various documents viz., methodology, registered PoA DD/1/, CPA DDs/3,4/ etc. |

### C.2. Consideration of materiality in conducting the verification

In accordance with CDM PoA VVS Version 1 para 307/13/ the prescribed thresholds for materiality for CDM PoAs is as under;

| Emission Reductions (tCO2e)/year | 500,000 or more | 300,001 to 499,999 | 300,000 or less | Small Scale CDM PoAs | Micro Scale CDM PoAs |
|---|---|---|---|---|---|
| **Materiality Threshold** | 0.5% | 1.0% | 2.0% | 5.0% | 10.0% |

The applicable materiality threshold is 5% as all the CPAs being verified under PoA are comprised of only small-scale.

| Particulars / Monitoring Report | MR Version (Public) | MR Version (Revised/Final) |
|---|---|---|
| **Emission Reductions Achieved (tCO2e) in this monitoring period** | 88,318 $tCO_2e$ | 11,791 $tCO_2e$* |
| **Applicable Threshold (%) as per para 307(d) of CDM VVS Version 1 for PoAs** | 5% | 5% |

The verification team has identified the impact of errors observed and those have been corrected by CME during verification for all monitoring parameter at individual and aggregate level.

| Monitored Parameter (Symbol / Description)/ formula | Reporting Frequency | Number of Discrete Data (Total)<br><br>Data (%) | Sample selected for verification<br><br>Data (%) | Type of error identified | Impact on ERs | |
|---|---|---|---|---|---|---|
| | | | | | ERs impacted (Sample)* | ERs impacted (Population based on extrapolation) |
| $\eta_{new,y}$ Efficiency of the system being deployed as part of the project | Annually | 30 (100%) | 30 (100%) | Errors raised and resolved in CAR 07 | No impact as 100% data has been verified | No impact as 100% data has been verified |

| | | | | | | |
|---|---|---|---|---|---|---|
| activity | | | | | | |
| $N_{all}$ Total number of stoves installed | Annually | 8190 in database<br><br>135 surveyed samples (100%) | 8190** (100% of database)<br><br>17 (12.59%) | No errors identified | No impact | No impact |
| SOF Stove Operation Fraction | Annually | 135 (100%) | 17 (12.59%) | No errors identified | No impact | No impact |
| $f_{old,}$ Fraction of end users that are still using baseline stoves | Annually | 135 (100%) | 17 (12.59%) | No errors identified | No impact | No impact |
| $\mu_{old,}$ The amount of woody biomass consumption that is consumed through the continued use of old stoves | Annually | 135 (100%) | 17 (12.59%) | No errors identified | No impact | No impact |
| $Stove_{year,}$ Calculated average stove operation years in the monitoring period | Annually | 8190 (100%) | 8190 (100%) | No errors identified | No impact | No impact |

*The ERs mentioned in MR (public) were actually the ex-ante emission reduction, written erroneously in the place of emission reduction achieved. The ER sheet transparently presenting actual achieved ERs was checked and CL#01 was raised and resolved.
** The database has been discounted for all the stoves for which end user data was not available which has reduced the emission reduction significantly.
Errors identified were raised as CAR #07, in response to which revised calculation sheet was shared by PP. This has also changed the emission reductions.
Based on the above table it can be confirmed that the actual individual and aggregated material error is determined for the registered PoA as per CDM VVS for PoA/13/. The applicable threshold for materiality in accordance with CDM PoA VVS Version 1 para 307(d)/13/ is 5%.
DOE assessment confirms that materiality of errors is within the threshold which implies that no material error is observed in the ER calculation.

## SECTION D. Means of verification

### D.1. Desk/document 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.

## D.2. On-site inspection

| Duration of on-site inspection: 23/07/2018 to 24/07/2018 | | | | |
|---|---|---|---|---|
| **No.** | **Activity performed on-site** | **Site location** | **Date** | **Team member** |
| 1. | Physical site visit: Households visited (implementation of PoA) | Lagos, Nigeria | 23/07/2018 to 24/07/2018 | Deepika Mahala |
| 2. | Review of information flows for generating, aggregating and reporting the monitoring parameters | Lagos, Nigeria | 23/07/2018 to 24/07/2018 | Deepika Mahala |
| 3. | Cross check between information provided in the monitoring report and data from other sources such as project database, sales receipts etc; | Lagos, Nigeria | 23/07/2018 to 24/07/2018 | Deepika Mahala |
| 4. | A check of the monitoring equipment including calibration performance and observations of monitoring practices against the applicable requirements | Lagos, Nigeria | 23/07/2018 to 24/07/2018 | Deepika Mahala |
| 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 | Lagos, Nigeria | 23/07/2018 to 24/07/2018 | Deepika Mahala |

## D.3. Interviews

| **No.** | **Interviewee** | | | **Date** | **Subject** | **Team member** |
|---|---|---|---|---|---|---|
| | **Last name** | **First name** | **Affiliation** | | | |
| 1. | Lohia | Rohit | Envirofit | 20/07/2018, 03/08/2018 (via phone) | ER sheet calculation, Monitoring report | Deepika Mahala |
| 2. | Olaore | Biodun | Envirofit Director | 23/07/2018 to 24/07/2018 | Implementation, ICS distribution, Sales Database, Monitoring survey, WBT, data review, Supervision | Deepika Mahala |
| 3. | Boye | Adeife | Envirofit Business Development Associate | 23/07/2018 to 24/07/2018 | Sales Database & monitoring data recording | Deepika Mahala |
| 4. | Djedo | Elizabeth | Envirofit Associate | 23/07/2018 to 24/07/2018 | Sales Database & monitoring data recording | Deepika Mahala |
| 5. | Ube | Chibuzor | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 6. | Wilson | Mary | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 7. | Samuel | Oni Idowo | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 8. | Aderibigbe | Stephen | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 9. | Adisa | Olubunmi | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 10. | John | Nsikak | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11. | - | Ganiyu | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 12. | Friday | Christiana | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 13. | Juliana | Opeifa | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 14. | Benedicth | Ngah | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 15. | Mojisola | Kehinde | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 16. | Benedicta | Bassey | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 17. | Edah Sunday | Di | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 18. | Aho | Josephine | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 19. | - | Oyewole | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 20. | Alieze | Cecilia | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |
| 21. | Nwonu | Nwek | ICS User | 23/07/2018 to 24/07/2018 | DOE Survey | Deepika Mahala |

## D.4. Sampling approach

A single sampling plan in accordance with AMS-II.G. version 3.0 /07/ 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/01/ and CPA DDs/3,4/ and 95/10 confidence precision was applied by CME, which is appropriate given the length of monitoring period and sampling was done across the CPAs covered. The detailed sampling approach undertaken by CME is duly explained under Section E.3.4.3 of monitoring report.

**DOE's sampling approach**:

The onsite physical verification approach (number of households/ICS) of the verification team was prepared in accordance with para 33 (a) & 33 (b) of "Standard for Sampling and surveys for CDM project activities and programmes of activities, Version 7/16/ considering the estimated annual ERs for the CPAs covered were less than 100,000 $tCO_2e$ and security conditions (conflict situations) in Nigeria (which is the host Party for the CPAs being verified) prevents inspection of many samples.
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 7:

- 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): 1% 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% were considered.

Apropos above, a sample size of 8 was required as per Table (page12) in the referred Standard/16/ for each sampling frame. Accordingly, Acceptance number (c) thus determined for the sample size is 0.

However, in order to account some potential non-responses due to non-availability of user household, logistic issues/constraints and prevailing security issues etc., a sample size of 9 was selected by the DoE meeting the required criteria.

The CPA being verified includes two types of ICS devices (wood (one model -M5000) and charcoal (two models CH2300 &CH5300)).Therefore selected required number (9 samples each for wood and charcoal category) were chosen randomly (using website www.randomizer.org) out of total of 135 CME's monitored samples (as part of monitoring survey). However, one non-availability (household owner was not present at home) was observed during the site visit.

The verification team verified total 17 samples of ICS (i.e., 9 for wood(M5000) & 8 for Charcoal (CH2300 and CH5300) Cookstoves) for the CPAs to verify the parameters SOF, (Stove Operation Fraction), $f_{old}$ (The fraction of end users that are still using baseline (replaced) stoves), $\eta_{new,y}$ (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) and $\mu_{old}$ (The amount of woody biomass consumption that is consumed through the continued use of old stoves) during site visit(physically and via phone) and observed that the sampling survey results of the CME for all the ICSs checked were consistent with DOE's field survey results.

## D.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 | CL#02 | - | - |
| Remaining forward action requests from validation and/or previous verification | - | - | - |
| CPA(s) considered for verification and covered in this report | - | - | - |
| **Programme of activities** | - | - | - |
| Compliance of the programme implementation with the registered PoA-DD | - | - | - |
| Implementation and operation of the management system | - | - | - |
| Post-registration changes | - | CAR#04 | - |
| • Temporary deviations from the registered monitoring plan, applied methodology or applied standardized baseline | - | - | - |
| • Corrections | - | - | - |
| • Inclusion of a monitoring plan | - | - | - |
| • Permanent changes to the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standardized baseline or other applied standards or tools | - | - | - |
| • Changes to the programme design or project design | - | - | - |
| • Change of coordinating/managing entity | - | - | - |
| • Changes specific to afforestation and reforestation activities | - | - | - |
| **Component project activities** | - | - | - |
| 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 of component project activities | - | - | - |

| | | | |
|---|---|---|---|
| • Inclusion of a monitoring plan | - | - | - |
| • Permanent changes to the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standardized baseline or other applied standards or tools | - | - | - |
| • Changes to the programme design of project design | - | - | - |
| • Changes specific to afforestation and reforestation component project activities | - | - | - |
| Compliance of the registered monitoring plan with the methodology including applicable tool(s) and standardized baseline | - | - | - |
| Compliance of monitoring activities with the registered monitoring plan | - | CAR#03, CAR#06 | - |
| • Data and parameters fixed ex ante or at renewal of crediting period | - | CAR#11 | - |
| • Data and parameters monitored | - | CAR#07, CAR#11 | FAR#12 |
| • Implementation of sampling plan | - | CAR#09 | - |
| Compliance with the calibration frequency requirements for measuring instruments | - | CAR#05, CAR#10 | - |
| Assessment of data and calculation of emission reductions or net removals | CL#01 | CAR#08 | - |
| • Calculation of baseline GHG emissions or baseline net GHG removals by sinks | - | - | - |
| • 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 CPA | - | - | - |
| • Remarks on difference from estimated value in included CPA | - | - | - |
| Assessment of reported sustainable development co-benefits | - | - | - |
| Global stakeholder consultation | - | - | - |
| Others (please specify) | - | - | - |
| **Total** | 2 | 9 | 1 |

## SECTION E. Verification findings

### E.1. General

#### E.1.1. Compliance of the monitoring report with the monitoring report form

| | |
|---|---|
| **Means of verification** | The verification team has compared the monitoring report/9/ with the applicable monitoring report form/20/ and found it to be fulfilling the guidelines of the FORM. |
| **Findings** | No findings. |
| **Conclusion** | Monitoring report is prepared using the correct template i.e. CDM-PoA-MR-FORM Version 02.0 /20/. The verification team confirms that the monitoring report has been appropriately prepared using the applicable monitoring report form, and that all sections are completed |

#### E.1.2. Remaining forward action requests from validation and/or previous verifications

There were no FARs during validation /2/ of PoA, inclusion /5,6/ of CPA or previous verification /21/ which needs to be closed during this monitoring period.

### E.1.3. CPAs considered for verification and covered in this report

| Title and UNFCCC reference number of the CPA included in the PoA as of the end of this monitoring period | Is the CPA considered for this verification? (yes/no) | The date when the CPA was included | Version of the PoA-DD | Confirmation that a request for issuance including the CPA has been published for the previous monitoring period (Y/N) |
|---|---|---|---|---|
| African Improved Cooking Stoves Programme of Activities CPA 00001 (Ghana) 5342-0001 | No | 06/12/2012 | Version 4.3, Dated 07/06/2014 | Y |
| African Improved Cooking Stoves Programme of Activities CPA 00002 (Ghana) 5342-0002 | No | 21/10/2013 | Version 4.3, Dated 07/06/2014 | Y |
| African Improved Cooking Stoves Programme of Activities CPA 00003 (Ghana) 5342-0003 | No | 08/11/2013 | Version 4.3, Dated 07/06/2014 | Y |
| African Improved Cooking Stoves Programme of Activities CPA 00004 (Nigeria) 5342-0004 | Yes | 23/09/2014 | Version 4.3, Dated 07/06/2014 | Y |
| African Improved Cooking Stoves Programme of Activities CPA 00005 (Nigeria) 5342-0005 | Yes | 23/09/2014 | Version 4.3, Dated 07/06/2014 | Y |
| African Improved Cooking Stoves Programme of Activities CPA 00006 (Liberia) 5342-0006 | No | 31/12/2014 | Version 4.3, Dated 07/06/2014 | N |

## E.2. Programme of activities

### E.2.1. 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/1/. The overall responsibility of implementation and operation is with the CME, which was also evident during the site visit. This was found to be consistent with PoA-DD/1/. There were a total 06 CPAs (5342-0001, 5342-0002, 5342-0003, 5342-0004, 5342-0005 & 5342-0006) found included at the end date of current monitoring period. However, this monitoring report includes the implementation and monitoring of two CPAs (5342-0004 & 5342-0005) located in Nigeria as part of registered PoA.<br><br>The implementation of the CPA (included in this request), as referenced above, are |

within the geographical boundary of the PoA DD/1/ and CPA DDs/3,4/ as both CPAs (5342-0004 & 5342-0005) are located in Nigeria.

The type of ICS distributed under the CPAs is of type M5000, CH2300 & CH5300 which is in line with the revised accepted PoA-DD/01/ and CPA-DDs/03,04/. The design efficiency of the ICSs are as follows, which have been verified from the technical specifications of the stoves/22/:

| | | Efficiency | Lifetime | Checked from |
|---|---|---|---|---|
| 5342-0004 | M5000 | 29.7% | 5years | Technical specifications of the ICSs were verified through the details provided by supplier /22/ |
| 5342-0005 | CH2300 | 39.4% | 5years | Technical specifications of the ICSs were verified through the details provided by supplier /22/ |
| 5342-0005 | CH 5300 | 35.7% | 5years | Technical specifications of the ICSs were verified through the details provided by supplier /22/ |

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. As checked from the sales database/23/, the total number of ICS deployed are 8,190 which is well within the maximum limit for the ICS distribution which is 27,926 as per the respective registered CPA DDs combined together.

| CPA Ref. No. | ICS type | Quantity of ICS Sold / Disseminated during the current verification | Maximum Estimated Qty ICSs in CPA |
|---|---|---|---|
| 5342-0004 | M5000 | 993 | 13,658 |
| 5342-0005 | CH2300 & CH5300* | 7,197 | 14,268 |
| Total | | 8,190 | 27,926 |

* CH5300 is a new model disseminated under CPA 05, which was found to meet the applicability criterion of applied methodology and the inclusion eligibility criteria as it has technical specifications/22/ similar to that of CH2300 and complies with requirements mentioned on page 5 of the 5342-0005 CPA DD/4/.

The verification team was able to confirm that the quantity, specification and target group of the ICS is consistent with the PoA DD /1/ 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/1/.
- The CME is same as that mentioned in the PoA-DD/1/
- The implementation and operation of the project activity has been conducted in accordance with the description contained in the PoA-DD/1/ and included CPA-DD/3,4/.
- All physical features of the CPA proposed in the included CPA-DD/3,4/ are

| | |
|---|---|
| | in place<br>• The project participants/CPA implementer has operated the CPA as per the included CPA-DD/3,4/.<br><br>The verification team has visited the 17 households during site visit. It was observed that each ICS was assigned a unique identification number, which ensures that no double counting occurs. The unique identification number on sampled ICSs, personal information of ICS owners and commissioning date of ICS were cross checked during the physical on-site inspection, primary record of sales database and 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-DDs/3,4/. The estimated CERs were 88,318 tCO2e whereas achieved ERs are 11,791 tCO2e for the current verification.<br><br>The CPA wise estimated CERs & achieved ERs were;<br>CPA Ref. No. \| Estimated ERs (tCO2e) \| Achieved ERs (tCO2e)<br>5342-0004 \| 44,159 \| 1,484<br>5342-0005 \| 44,159 \| 10,307<br><br>The verification team considers the project description of the project contained in the PoA-DD/1/ is complete and accurate. The PoA-DD/1/ 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/1/ and found to be correct. |
| **Findings** | CL#02 was raised and resolved. |
| **Conclusion** | a) The verification team confirms that the physical features (technology/type of ICS) of the implementation were in accordance with the PoA DD/01/.<br>b) The actual operation is in line to respective CPA DDs/3,4/, which is further explained under Section E.3. of this report.<br>c) The number of installations in the CPAs for the type of ICS were less than the maximum quantity estimated in the CPA-DD/3,4/. This is due to the reason that the ICSs 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>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/3,4/. |

### E.2.2. 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 verification team has checked the cookstove sales database/23/ 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"/24/ to the |

| | |
|---|---|
| | verification team. The verification team has checked the PPT for the training and also interviewed few of the trained monitoring staff/field officers 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** | No findings |
| **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 /9/. The verification team confirms that the monitoring management system of the PoA is in place with the responsibilities properly identified and established. |

### E.2.3. Post-registration changes

#### E.2.3.1. Temporary deviations from the registered monitoring plan, applied methodology or applied standardized baseline

Not applicable

#### E.2.3.2. Corrections

Not applicable

#### E.2.3.3. Inclusion of a monitoring plan

Not applicable

#### E.2.3.4. Permanent changes to the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standardized baseline or other applied standards or tools

Not applicable

#### E.2.3.5. Changes to the programme design or project design

A previously approved PRC to expand the PoA boundary to include Liberia exists at:
https://cdm.unfccc.int/PRCContainer/DB/prcp237694862/view
Ref. No. PRC-5342-001 approval date 16/06/2014

#### E.2.3.6. Change of coordination/managing entity

Not applicable

#### E.2.3.7. Changes specific to afforestation and reforestation activities

Not applicable

### E.3. Component project activities

#### E.3.1. 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, CH5300 & 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*** | ***Means of*** |
|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| | | | | ***verification*** |
| | Inclusion date of CPAs | 23/09/2014 | 23/09/2014 | UNFCCC webpage for PoA 5342/25/. |
| | Location | Nigeria | Nigeria | Checked from CPA DDs/3,4/ and site visit to the project location. |
| | Product Type | ICS | ICS | Checked from CPA DDs/3,4/ and site visit to the project location. |
| | ICS Model | M5000 | CH2300, CH5300 | CPA DDs/3,4/ and sales database/23/. CH5300 is a new model disseminated under CPA 05, which was found to meet the applicability criterion of applied methodology as it has technical specifications/22/ similar to CH2300 and complies with requirements mentioned on page 5 of the 5342-0005 CPA DD/4/ as well as the eligibility criteria mentioned in the CPA DD/4/. |
| | Quantity Sold / Disseminated | 993 | 7,197 | Sales database/23/ |
| | Total stoves after discounting for repetitive entries | 631 | 3,981 | ER sheet/11/ |
| | Maximum Estimated ICSs in CPA | 13,658 | 14,268 | CPA DDs/3,4/ |
| | ICS sales start date | 06/02/2013 | 09/01/2013 | CPA DDs/3,4/ |
| | Estimated CERs (comparable period) | 44,159 | 44,159 | CPA DDs/3,4/ |
| | Actual CERs from the ICS Type | 1,484 tCO2e | 10,307 tCO2e | ER calculation sheet/11/ |
| | Thermal savings achieved | 5.43 $GWh_{th}$ | 37.73 $GWh_{th}$ | ER calculation sheet/11/ |

ICS were distributed in Nigeria, which is consistent with the description given in the included CPA-DDs/3,4/. By the end of current monitoring period the total number of cook stoves disseminated under the two CPAs, were within estimated quantity of ICSs as per CPA DDs/3,4/. It has been confirmed by the transparent calculation presented in the ER sheet/11/ that the CPA is below the threshold of 180 GWh/year (thermal).

| | |
|---|---|
| **Findings** | CL#02 was raised and resolved. |
| **Conclusion** | a) The verification team is of the opinion that physical features of the CPAs have been implemented in accordance with the CPA-DD/3,4/.<br>b) No specific monitoring equipment had to be installed according to the monitoring plan/1,3,4/.<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/3,4/.<br>d) The CPAs were also found to be completely operational in line with the CPA- |

| | |
|---|---|
| | DD/3,4/.<br>e) The information provided in the relevant sections of the monitoring report are appropriately describe the implementation and operational status of the PoA/1/. |

### E.3.2. Post-registration changes

#### E.3.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

Not applicable

#### E.3.2.2. Corrections

Not applicable

#### E.3.2.3. Changes to the start date of the crediting period of component project activities

Not applicable

#### E.3.2.4. Inclusion of a monitoring plan

Not applicable

#### E.3.2.5. Permanent changes to the registered monitoring plan or permanent deviation of monitoring from the applied methodology, standardized baseline, or other applied standards or tools

Not applicable

#### E.3.2.6. Changes to the programme design or project design

Not applicable

#### E.3.2.7. Changes specific to afforestation and reforestation component project activities

Not applicable

### E.3.3. Compliance of the registered monitoring plan with the methodology including applicable tool(s) and standardized baseline

| | |
|---|---|
| **Means of verification** | The monitoring plan as contained in respective CPA-DD/03,04/ was reviewed against the monitoring requirements of the applied methodology AMS-II.G. version3.0/7/ as well as PoA-DD/1/ with reference to the technology involved. Based on this review it was found that the monitoring plan contained in the CPA-DD/3,4/ 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/1/ 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 3.0/07/ as included in the respective CPA-DDs /3,4/. |

## E.3.4. Compliance of monitoring activities with the registered monitoring plan

### E.3.4.1. Data and parameters fixed ex ante or at renewal of crediting period

#### E.3.4.1.1. Annual average biomass consumption per appliance, $Q_{biomass}$, Tonnes/year

| | |
|---|---|
| **Means of verification** | The value of the parameter was determined from literature review using sources and conservative assumptions indicated in Appendix 4 of CPA DDs/3,4/.<br>The values considered for this monitoring period are:<br>CPA UN Ref. No. \| Value applied \| Checked from<br>**5342-0004** \| 4.94 Tonnes/year \| CPA-DD /3/ page 24<br>**5342-0005** \| 4.5 Tonnes/year \| CPA-DD /4/ page 25 |
| **Findings** | CAR#11 was raised and resolved. |
| **Conclusion** | The values in the Monitoring Report /9/ and corresponding Emission Reduction Spreadsheet /11/ are consistent with the CPA-DDs /3,4/. The values applied for ER calculations sheet /11/ for the relevant CPAs are correct and justified. |

#### E.3.4.1.2. 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 of the parameter was determined from Value derived from the Annex 14 Paragraph 4 of the 37 meeting of the SSC WG report./18/<br>The values considered for this monitoring period are:<br>CPA UN Ref. No. \| Value applied \| Checked from<br>**5342-0004** \| 0.93 \| CPA-DD /3/ page 24<br>**5342-0005** \| 0.93 \| CPA-DD /4/ page 25 |
| **Findings** | No finding was raised. |
| **Conclusion** | The values in the monitoring Report /9/ and corresponding Emission Reduction Spreadsheet /11/ are consistent with the CPA-DDs /3,4/. The values applied for ER calculations sheet /11/ for the relevant CPAs are correct and justified. |

#### E.3.4.1.3. Net calorific value of the non-renewable biomass that is substituted, $NCV_{biomass}$ , TJ/tonne

| | |
|---|---|
| **Means of verification** | The parameter value is sourced from 2006 IPCC guidelines for National Greenhouse Gas Inventories/12/.<br>The values considered for this monitoring period are:<br>CPA UN Ref. No. \| Value applied \| Checked from<br>**5342-0004** \| 0.015 TJ/tonne \| CPA-DD /3/ page 25<br>**5342-0005** \| 0.015 TJ/tonne \| CPA-DD /4/ page 26 |
| **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/1/, applied methodology/7/ and CPA-DDs /03, 04/. The values applied for ER calculations sheet /11/ for the relevant CPAs are correct and justified. |

#### E.3.4.1.4. Emission factor for the substitution of non-renewable biomass by similar consumers, $EF_{projected\_fossilfuel}$, $tCO_2/TJ$

| | |
|---|---|
| **Means of verification** | The parameter value is sourced from 2006 IPCC guidelines for National Greenhouse Gas Inventories/12/.<br>The values considered for this monitoring period are:<br>CPA UN Ref. No. \| Value applied \| Checked from<br>**5342-0004** \| 81.6 tCO2/TJ \| CPA-DD /3/ page 25<br>**5342-0005** \| 81.6 tCO2/TJ \| CPA-DD /4/ page 26 |
| **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, applied methodology /7/ and CPA-DDs /3,4/. The values applied for ER calculations sheet /11/ for the relevant CPAs are correct and justified. |

#### E.3.4.1.5. Efficiency of the system being replaced, $\eta_{old}$, Efficiency

| | |
|---|---|
| **Means of verification** | The value of the parameter was determined as a weighted average of default values given in the methodology/7/ for traditional and improved stove in baseline |

| | |
|---|---|
| | scenario. Country profile provided by Global Alliance for Clean Cookstoves was reviewed to source the percentage of the penetration of traditional / open fired cookstoves in Nigeria/19/.<br>The value considered for this monitoring period is<br>CPA UN Ref. No. \| Value applied \| Checked from<br>**5342-0004** \| 0.106 \| CPA-DD /3/ page 25<br>**5342-0005** \| 0.106 \| CPA-DD /4/ page 26 |
| **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/1/ and CPA-DDs /3,4/ are in accordance with applied methodology/7/. The values applied for ER calculations sheet/11/ for the relevant CPAs are correct and justified. |

#### E.3.4.1.6. Net to gross adjustment factor to account for leakages, LAF, Fraction

| | |
|---|---|
| **Means of verification** | The value, which is a default sourced from the applied methodology/7/ was considered for both the CPAs covered in this report. The values are as following:<br>CPA UN Ref. No. \| Value applied \| Checked from<br>**5342-0004** \| 0.95 \| CPA-DD /3/ page 26<br>**5342-0005** \| 0.95 \| CPA-DD /4/ page 26 |
| **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/1/, applied methodology/07/ and CPA-DDs/03,04/. The values applied for ER calculations sheet/11/ for the relevant CPAs are correct and justified. |

### E.3.4.2. Data and parameters monitored

#### E.3.4.2.1. 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 | Annually |
| | Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | The surveys and WBTs were conducted in March-May 2018.<br>Yes. The measuring and reporting frequency are in line to registered CDM PoA DD/1/, CPA DDs/3,4/ and applied methodology/7/. |
| | Monitoring equipment | The Water Boiling Tests (WBTs)/26,27/ were conducted by trained CME personal and undertaken according to applied methodology/7/ supported by PCIA/28/. The PoA DD/1/ or CPA DDs/3,4/ do not prescribe any specific monitoring equipment but weighing scale, moisture meter and thermometer were required and used to conduct WBT.<br>The details of the equipment used for WBT are mentioned below -<br>**Equipment**<br>**Thermometer:**<br>Brand: Omega<br>Model: Omegaette HH308 Type K<br>Accuracy: +/- 0.3% reading +1$^0$C<br>Number of units: 3<br>S/N: 130803109, 141203661 and 141203662 |

| | | |
|---|---|---|
| | | **Mass balance**<br>Brand: KERN<br>Model: EMS 12K0.1<br>Accuracy: +/- 0.3gm<br>Number of units: 1<br>S/N: WD140099205<br>**Moisture Meter**<br>Brand: TROTEC<br>Model: T500<br>Accuracy: +/- 1%<br>Number of units: 1<br>S/N: 3510207500<br>The calibration requirements were found acceptable as checked from the calibration certificates and manufacturer's specification/32,33,34/. These are described under Section E.3.4.4 of this report. |
| | Is accuracy of the monitoring equipment as stated in the monitoring plan? If the monitoring plan does not specify the accuracy of the monitoring equipment, does the accuracy of the monitoring equipment comply with local/national standards, or as per the manufacturer's specification? | There is no accuracy class defined in the registered PoA DD/1/ or CPA DDs/3,4/ so it was checked and found acceptable as per manufacturer's specification/32,33,34/. |
| | Is the accuracy valid for the entire measuring range or do different accuracy levels apply to different measuring ranges? | The reported accuracy class was found applicable to the entire monitoring range. |
| | Calibration frequency /interval: | Calibration frequency is not defined in the CPA DDs/3,4/ or applied methodology/7/, however, the CME has calibrated the equipment used according to the manufacturer's specification/34,35,36/.<br>Please refer to section E.3.4.4. of this report for detailed assessment. |
| | Is the calibration interval in line with the monitoring plan and/or methodology? If the monitoring plan does not specify the frequency of calibration, is the selected frequency in accordance with the local/national standards, or as per the manufacturer's specifications? | Calibration frequency is not defined in the CPA DDs/3,4/ or applied methodology/7/, however, the CME has calibrated the equipment used according to the manufacturer's specification/34,35,36/.<br>Please refer to section E.3.4.4. of this report for detailed assessment. |
| | Is the calibration of measuring equipment carried out by an accredited person or institution? | Please refer to section E.3.4.4. of this report for detailed assessment. |
| | Is(are) calibration(s) valid for the whole reporting period? | No delay in calibration was observed. Calibration frequency is not defined in the CPA DDs/3,4/ or applied methodology/7/, however, the CME has calibrated the equipment used according to the manufacturer's specification/34,35,36/. |

<table>
<tr><td></td><td>
<table>
<tr><td></td><td>Please refer to section E.3.4.4. of this report for detailed assessment.</td></tr>
<tr><td>Is the calibration carried out for a measuring range comparable with the range for which measurements have been carried out?</td><td>Yes, the calibration has been carried out for a range comparable with the range for which measurements have been carried out</td></tr>
<tr><td>How were the values in the monitoring report verified?</td><td>The WBT calculation Sheets/29,26,27/ provided by PP were checked.<br>The value of the parameter is mentioned below as per type/ model of ICS
<table>
<tr><th>Stove model</th><th>CPA Ref. No.</th><th>Monitored Efficiency</th></tr>
<tr><td>M5000</td><td>5342-0004</td><td>28.27%</td></tr>
<tr><td>CH2300</td><td>5342-0005</td><td>31.01%</td></tr>
<tr><td>CH5300</td><td>5342-0005</td><td>32.59%</td></tr>
</table>
The results are based on representative sampling as prescribed in the registered monitoring plan. There were 10 random samples selected for each model (M5000, CH2300 and CH5300) of ICS as against the required number 7 for each. The verification team checked the primary record/26,27/ and WBT calculation sheet/29/ for each of them and found the results as included in the ER calculation sheets/11/ to be correct.</td></tr>
<tr><td>If applicable, has the reported data been cross-checked with other available data?</td><td>The verification team has checked all the stove efficiency test (WBT) results/26,27/ and found out the efficiency of the ICS to be consistent. The monitored efficiencies of the ICSs were within the designed efficiencies as given in the CPA DDs/03,04/ and comparable with the previous monitoring period/21/.</td></tr>
<tr><td>Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?</td><td>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 /28/. The WBT Sheets/26,27/ provided by PP have been checked and found to be satisfactory.</td></tr>
<tr><td>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?</td><td>Not applicable</td></tr>
</table>
</td></tr>
<tr><td>Findings</td><td>CAR#03 and CAR#07 were raised and resolved.</td></tr>
<tr><td>Conclusion</td><td>The parameter has been monitored appropriately, in accordance with the registered monitoring plan/3,4/ (as per measurement methods and procedures to be applied) and applied methodology/7/. The monitoring results were recorded consistently as per the</td></tr>
</table>

| | |
|---|---|
| | approved frequency in the monitoring plan/3,4/. |

**E.3.4.2.2. Total number of stoves installed, $N_{all}$, Number**

| Means of verification | Criteria/Requirements | Assessment/Observation |
|---|---|---|
| | Measuring /Reading /Recording frequency | The recording of the sales was done in a regular basis during the crediting period and the monitoring is done 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/7/. |
| | Monitoring equipment/Source | CPA Distribution Records and logbooks (Sales database/23/) |
| | Calibration frequency /interval: | Not applicable |
| | How were the values in the monitoring report verified? | The values in the MR were verified from the Sales database/23/ during the on-site inspection. These are also included in the ER sheet/11/. |
| | If applicable, has the reported data been cross-checked with other available data? | The values were checked from the sales database/23/. 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/09/. The value of $N_{all}$ applied for ER calculations is lower than the actual number of distributed ICS, due to discounting of stove population by proportion households reporting more than one EF stoves during the monitoring surveys. The discount factor applied has been calculated as total number of stoves distributed multiplied by number of samples who reported using another biomass ICS to total number of samples surveyed. The procedure of discounting is as per registered monitoring plan/3,4/.<br>*The stove IDs for which the end user data was not available have been discarded from the database and not considered for claiming emission reduction. |
| | 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 Director 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 verification team by interviewing the Director & the person responsible for the data recording. |
| | In case project | Not applicable |

| CPA Ref. No. | Stove model | As per database | Discounted Number as monitoring results | *Total stoves after discarding entries with no end user data |
|---|---|---|---|---|
| 5342-0004 | M5000 | 993 | 961 | 631 |
| 5342-0005 | CH2300 and CH5300 | 7,197 | 6,901 | 3981 |

| | | |
|---|---|---|
| | 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? | |
| **Findings** | CAR#11 was raised and resolved. FAR#12 has been raised. | |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the registered monitoring plan/3,4/ (as per measurement methods and procedures to be applied) and applied methodology/7/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/3,4/. | |

**E.3.4.2.3. 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/7/. |
| | Monitoring equipment | Survey questionnaires/30,31/ |
| | 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/30,31/.<br><br>**CPA Ref.** / **Model** / **Value**<br>5342-0004 / M5000 / 0.903<br>5342-0005 / CH2300 & CH5300 / 0.945 |
| | 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 17 samples (9 samples for M5000 & 8 samples for CH2300 and CH5300) for DOE's field survey and via interview found out that all the ICS which are picked up for sampling are installed at the households and were in working condition, 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 verification team has also checked the monitoring survey results /30,31/ 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/3,4/ (as per measurement methods and procedures to be applied) and applied methodology/7/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/3,4/. | |

### E.3.4.2.4. 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, the measuring and reporting frequency are in line to registered CDM PoA DD/1/, CPA DDs/3,4/ and applied methodology/7/. |
| | Monitoring equipment | Survey questionnaire/30,31/ |
| | Calibration frequency /interval: | Not applicable |
| | How were the values in the monitoring report verified? | The values in the MR/9/ were calculated using the values obtained from the monitoring survey, which were verified from filled survey forms/31/ and monitoring survey records/30/.<br><br>The survey questionnaire was used as the tool to conduct interviews of selected sample households in which the ICS are implemented and functioning. The verified values are as given below: |

| Stove model | Value | CPA Ref. No. |
|---|---|---|
| M5000 | 0.498 | 5342-0004 |
| CH2300, CH5300 | 0.101 | 5342-0005 |

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 ($f_{non\text{-}old}$),

Based on the registered CPA-DDs/3,4/, the fraction of

| | | |
|---|---|---|
| | | users not using the baseline stoves ($f_{non,old}$) has been monitored. Then fold has been calculated as 1 – $f_{non-old}$. |
| | 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 17 samples (9 samples for M5000 & 8 samples for CH2300 and CH5300) for DOE's field survey and via 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 verification team has also checked the monitoring survey results /30,31/ vis-à-vis the DOE site visit samples and found that the results are comparable.<br><br>AS checked from the ER sheet/11/, the required precision is met for charcoal stoves but not for wood stoves. Therefore, for wood stoves upper bound value (lower bound for $f_{non\ old}$) and for charcoal stoves direct value of the survey results/30/ have been used for ER calculation. |
| | 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#06 was raised and resolved. | |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the registered monitoring plan/3,4/ (as per measurement methods and procedures to be applied) and applied methodology/7/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/3,4/. | |

**E.3.4.2.5. 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. The measuring and reporting frequency are in line to registered CDM PoA DD/1/, CPA DDs/3,4/ and applied methodology/7/. |
| | Monitoring equipment | Survey questionnaire |

<table>
<tr><td></td><td>Calibration frequency /interval:</td><td>Not applicable</td></tr>
<tr><td></td><td>How were the values in the monitoring report verified?</td><td>The values in the MR/9/ were calculated using the values obtained from the monitoring survey, which were verified from filled survey forms/31/ and monitoring survey records/30/.
<table>
<tr><td>The survey questionnaire was used as the tool to conduct interviews of selected sample households in which the ICS are implemented and functioning. The verified values are as given below:Stove model</td><td>Value (kg/year)</td><td>CPA Ref. No.</td></tr>
<tr><td>M5000</td><td>1,762</td><td>5342-0004</td></tr>
<tr><td>CH2300, CH5300</td><td>1,904</td><td>5342-0005</td></tr>
</table>
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.</td></tr>
<tr><td></td><td>If applicable, has the reported data been cross-checked with other available data?</td><td>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 17 samples (9 samples for M5000 & 8 samples for CH2300 and CH5300) for DOE’s field survey and via 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.</td></tr>
<tr><td></td><td>Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?</td><td>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 verification team has also checked the monitoring survey results /30,31/ vis-à-vis the DOE site visit samples and found that the results are comparable.<br><br>As checked from the ER sheet /11/, the required precision is not met for all the stove types(wood/charcoal). Thus, upper bound values of the survey results/30/ have been used in the calculation of ERs.</td></tr>
<tr><td></td><td>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?</td><td>Not applicable</td></tr>
<tr><td>Findings</td><td colspan="2">No findings.</td></tr>
<tr><td>Conclusion</td><td colspan="2">The parameter has been monitored appropriately, in accordance with the registered monitoring plan/03,04/ (as per measurement methods and procedures to be applied) and applied methodology/07/. The monitoring results were recorded consistently as per the</td></tr>
</table>

| | |
|---|---|
| | approved frequency in the monitoring plan/3,4/. |

**E.3.4.2.6. 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. The measuring and reporting frequency are in line with the registered CDM PoA DD/1/, CPA DDs/3,4/ and applied methodology/7/. |
| | Monitoring equipment | PoA Distribution and Monitoring Database (sales database)/23/. |
| | 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 for which a stove operational period overlaps with the monitoring period. It is described as calculated average stove operation years in the monitoring period. If stoves have been operating for 365 days then $Stove_{year}$ = 1.0. If less than 365 days, then $Stove_{year}$ is represented as a fraction of 365 (e.g., 180 days= 0.5). |
| | 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. No error was identified by verification team pertaining to the sample selected for visit. |
| | 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 |

| Stove model | Value | CPA |
|---|---|---|
| M5000 | 0.62 | 5342-0004 |
| CH2300, CH5300 | 0.50 | 5342-0005 |

| | |
|---|---|
| **Findings** | No findings. |
| **Conclusion** | The parameter has been monitored appropriately, in accordance with the registered monitoring plan/03,04/ (as per measurement methods and procedures to be applied) and applied methodology/07/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/03,04/. |

### E.3.4.3. 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/. The monitoring period covered the period between and including 25/10/2016 – 24/10/2017.

A single sampling plan was carried out across all specific-case CPAs covered in this monitoring period. 02 CPAs viz., 5342-0004 and 5342-0005 were covered in the single sampling plan.

**Sampling Design/Target Population/Sampling Frame/Reliability:**
A simple random sampling method was used by PP, which is in line with the monitoring plan of the PoA DD/1/ (Section B.7.2) and the respective CPA-DDs/3,4/. 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 7/16/.

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 type as separate population. As per page 53 and page 57 of the PoA-DD/1/, for other parameters (SOF, $f_{old}$, $\mu_{old}$), the homogeneity of the population was demonstrated in compliance with the following conditions;

| Homogeneity condition | Characteristic of Population | Status of population | Verification team conclusion |
|---|---|---|---|
| Country | all units have been distributed in the same geographical area, i.e. Nigeria as confirmed during the DOE site visit. | Homogeneous | Ok, based on assessment of stove sales database/23/ 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 as confirmed during the DOE site visit. | 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 is in line with registered sampling plan/3,4/ and is deemed appropriate by the verification team. |
| End user – domestic / small-medium enterprises / community | all units are for domestic (household) usage as per their design as confirmed during the DOE site visit. | 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 are following models under each sampling frame:<br><br>1. for charcoal – it is CH2300 and CH5300<br>2. for woodfuel – it is M5000 as confirmed during the DoE site visit. | Homogeneous in wood fuel sample frame and Heterogeneous in charcoal sample frame | CH2300 and CH5300 are being within +/-10% of each other and they have other common design features as checked from the manufacturer's specification of the ICS/22/. |

**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 7/16/.

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/.

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 7/16/ was correctly applied in case the sample size for mean parameter was found as less than 30. 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 MR/09/ (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 ER sheet (worksheet "Sample size calculations")/11/ with reliability as 95/10 for each of the parameter.

| | |
|---|---|
| | **Data collection**<br>Data was collected for SOF, $f_{old}$ and $\mu_{old}$ following a specially design survey form. As for the thermal efficiency of the stoves, WBTs were conducted using WBT protocol as given by PCIA/28/. Refer ER calculator worksheet/11/ "Monitoring Survey summary", "WBT Summary" and "WBT calculator"/29/ for details on data collected during monitoring. In this regard, worksheet "sample size calculations" /11/ was checked and found to be correct as per registered monitoring plan/3,4/.<br><br>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.<br><br>Based on the verified results the verification team found the following result:<br>1) $\eta_{new}$ - required precision is met for all the stove models (CH2300, CH5300 and M5000). Therefore, the WBT results/29/ were directly used in the calculation of ERs.<br>2) SOF - required precision is met for all the stove types(wood/charcoal). Therefore, the survey results /30/ for this parameter were directly used in the calculation of ERs.<br>3) $f_{old}$ – required precision is met for charcoal stoves but not for wood stoves. Therefore, for wood stoves upper bound value (lower bound for $f_{non\ old}$) and for charcoal stoves direct value of the survey results/30/ have been used for ER calculation.<br>4) $\mu_{old}$- required precision is not met for all the stove types(wood/charcoal). Thus, upper bound values of the survey results/30/ have been used in the calculation of ERs. |
| **Findings** | CAR#09 was raised and resolved. |
| **Conclusion** | The verification team confirmed that the sampling plan and the parameter values are in accordance with the monitoring plan provided in PoA DD /1/. |

### E.3.4.4. Compliance with the calibration frequency requirements for measuring instruments

| | |
|---|---|
| **Means of verification** | Details of the equipment used for WBT are as provided below:<br><br>**Equipment** / **Calibration Details**<br>**Mini-thermometer:**<br>Brand: Omega<br>Model: Omegaette HH308 Type K<br>Accuracy: +/- 0.3% reading +1$^0$C<br>Number of units: 03<br>S/N: 130803109, 141203661, 141203662<br>— Calibration conducted on 08/05/2018 by third party SELFA Nigeria Ltd/32/. The validity of calibration is 1 year. The devices were duly calibrated prior to the water boiling test survey reported in the survey forms/26,27/.<br>**Mass balance**<br>Brand: KERN<br>Model: EMS 12K0.1<br>Accuracy: +/- 0.3 gm<br>Number of units: 01<br>S/N: WD140099205<br>— Calibration conducted on 08/05/2018 by third party SELFA Nigeria Ltd/33/. The validity of calibration is 1 year. The device was duly calibrated prior to the water boiling test survey reported in the survey forms/26,27/.<br>**Moisture Meter**<br>Brand: TROTEC<br>Model: T500<br>Accuracy: +/- 1%<br>Number of units: 1<br>S/N: 3510207500<br>— The moisture meter (TROTEC T500) has an auto-calibration feature built in it, as per the technical specifications of the instrument/34/, as verified by the verification team.<br><br>The verification team has checked the user manual/34,35,36/ of the respective monitoring equipment and found calibration requirement met. The date of first WBT was confirmed from the WBT records for CPA#4 and CPA#5 as 18/05/2018 which clearly after the date of calibration of the instruments. Therefore, the verification |

| | |
|---|---|
| | team confirms that the measurements were done with calibrated devices. |
| **Findings** | CAR#10 and CAR#05 were raised and resolved. |
| **Conclusion** | The verification team confirm that CME applied good practice by for data collection & sampling survey and the equipment's used for sample surveyed are duly calibrated. |

### E.3.5. Assessment of data and calculation of emission reductions or net removals

#### E.3.5.1. 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 E.3.4.2. of this report. The complete monitoring data is also presented in the corresponding ER calculations sheet/11/ of final Monitoring Report/9/.<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 E.3.4.2. of this report.<br>c) The calculations of baseline emissions as presented in the corresponding ER calculations sheet /11/ of final Monitoring Report /9/ were checked and found to be consistent with the formulae and methods described in the registered monitoring plan of each relevant CPA-DD/3,4/, PoA-DD/1/ and the applied methodology/7/.<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 E.3.4.1 of this report.<br>f) No standardized baseline was prescribed in the PoA DD/1/ and therefore it has not been applied.<br>g) There is no pro-rate approach 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 /9/ and applied in the corresponding ER calculations sheets /11/. The expressions used were found consistent with the revised PoA-DD/1/, CPA-DDs/3,4/ and the applied methodology AMS-II.G., version 03/7/:<br><br>Total ER reductions achieved for any CPA is calculated using the following expressions:<br><br>$ER_y = B_{y,savings} \cdot f_{NRB} \cdot NCV_{biomass} \cdot EF_{projected\ fossil_{fuel}}$<br><br>$B_{y,savings} = B_{old} \cdot \left(1 - \frac{\eta_{old}}{\eta_{new}}\right)$<br><br>$B_{old} = LAF \cdot N_{all} \cdot SOF \cdot (Q_{biomass} - (\frac{\mu_{old}}{1000} \cdot f_{old})) \cdot Stove_{year}$<br><br>It has been verified that the corresponding ER calculations sheet /11/ to the final Monitoring Report /9/ 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** | CL#01 and CAR#08 raised and resolved |
| **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 E.3.4.2. 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 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. |

### E.3.5.2. Calculation of project GHG emissions or actual net GHG removals by sinks

| | |
|---|---|
| **Means of verification** | The PoA DD/01/, CPA DD/03,04/ and applied monitoring methodology/07/ 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. |

### E.3.5.3. Calculation of leakage GHG emissions

| | |
|---|---|
| **Means of verification** | The PoA DD/1/, CPA DD/3,4/ and applied monitoring methodology/07/ do 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 03 /7/. |

### E.3.5.4. 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 /9/ and corresponding ER calculations sheet /11/ were found appropriate and complying with the provisions prescribed in the registered monitoring plan of respective CPA-DD/3,4/, PoA-DD/1/ and applied methodology/7/. 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 E.3.4.2 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 that 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 11,791 $tCO_2e$. |

| Title and UNFCCC reference number of the CPA | 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 ($tCO_2e$) | | |
|---|---|---|---|---|---|---|
| | | | | Amount achieved before 1 January 2013 | Amount achieved from 1 January 2013 | Amount achieved in the entire monitoring period |
| African Improved Cooking Stoves Programme of Activities CPA 00004 (Nigeria) 5342-0004 | 1,484 | 0 | 0 | 0 | 1,484 | 1,484 |
| African Improved Cooking Stoves Programme of Activities CPA 00005 (Nigeria) 5342-0005 | 10,307 | 0 | 0 | 0 | 10,307 | 10,307 |
| **Total** | **11,791** | **0** | **0** | **0** | **11,791** | **11,791** |

### E.3.5.5. Comparison of actual GHG emission reductions or net GHG removals by sinks with estimates in included CPA

| | |
|---|---|
| **Means of verification** | As verified from the final Monitoring Report/9/ and corresponding ER calculations sheet /11/, the actual emission reductions achieved by each CPA that is included in the current monitoring period were found to be less than the estimated quantity in the respective CPA-DD/03,04/ for the comparable period. |
| **Findings** | No findings. |
| **Conclusion** | The actual emission reductions achieved in specific CPA were not higher than the estimated quantity of ERs in the respective CPA-DD/3,4/. Therefore, it was accepted by the verification team. |

| Title and UNFCCC reference number of the CPA | Value estimated in ex ante calculation in the included CPA-DD(s) | Actual values achieved by the CPAs during this monitoring period |
|---|---|---|
| African Improved Cooking Stoves Programme of Activities CPA 00004 (Nigeria) 5342-0004 | 44,159 | 1,484 |
| African Improved Cooking Stoves Programme of Activities CPA 00005 (Nigeria) 5342-0005 | 44,159 | 10,307 |
| **Total** | **88,318** | **11,791** |

### E.3.5.6. Remarks on difference from estimated value in included CPA

| | |
|---|---|
| **Means of verification** | The achieved emission reductions were less than the estimated ERs in the CPA DD/3,4/. Thus, no further explanation was sought by verification team. |
| **Findings** | No finding was raised. |
| **Conclusion** | The achieved ERs were less than the estimated amount for the comparable period. |

### E.3.6. Assessment of reported sustainable development co-benefits

| | |
|---|---|
| **Means of verification** | Not applicable |
| **Findings** | Not applicable |
| **Conclusion** | Not applicable |

### E.3.7. Global stakeholder consultation

| | |
|---|---|
| **Means of verification** | Not applicable as this is not the first monitoring period. |
| **Findings** | Not applicable |
| **Conclusion** | Not Applicable |

## SECTION F. 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 G. Verification opinion

Earthood Services Private Limited (ESPL), contracted by Envirofit International Ltd. (the CME for the PoA), has performed an 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 fifth monitoring period 25/10/2016 - 24/10/2017 (both dates included) as reported in the Monitoring Report (public) Version 1 dated 11/06/2018. 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.

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 revised accepted 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 4.0 dated 24/01/2019 and corresponding ER sheets for the monitoring period 25/10/2016 - 24/10/2017 (including both days) amount as 11,791 tCO2e. Therefore, this will be submitted as part of request for issuance as per CDM PCP Version 1.0.

## SECTION H. 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 25/10/2016 - 24/10/2017 are fairly stated in the Monitoring Report (final) Version 4.0 dated 24/01/2019.

ESPL, based on outcome of verification activities, certify in writing that, during the monitoring period 25/10/2016 - 24/10/2017 (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 11,791 $tCO_2e$ 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 | 1,484 |
| 5342-0005 | 0 | 10,307 |
| **Total** | **0** | **11,791** |

# 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 |
| CEP | Clean Energy Product |
| CER | Certified Emission Reduction |
| CL | Clarification Request |
| CME | Coordinating or Managing Entity |
| CP | Crediting period |
| CPA | Component Project Activity |
| DNA | Designated National Authority |
| DOE | Designated Operational Entity |
| EB | Executive Board |
| EIL | Envirofit International Ltd |
| EF | Envirofit |
| EPTP | Stove Manufacturers Emissions and Performance Test Protocol |
| ESPL | Earthood Services Private Limited |
| FAR | Forward Action Request |
| GACC | Global Alliance for Clean Cookstoves |
| GHG | Greenhouse Gas(es) |
| ICS | Improved Cook Stove |
| IPCC | Intergovernmental Panel on Climate Change |
| PoA-DD | Programme of activities Design Document |
| PPT | PowerPoint Presentation |
| RMP | Registered monitoring plan |
| SQIL | Sonic Quality Inspectors Limited |
| TA | Technical Area (with in Sectoral Scope) |
| TR | Technical Reviewer |
| UNFCCC | United Nations Framework Convention on Climate Change |
| UQL | Unacceptable Quality Level |
| VVS | Validation and Verification Standard |
| WBTs | Water Boiling Tests |

# Appendix 2. Competence of team members and technical reviewers

| Competence Statement | |
|---|---|
| **Name** | Deepika Mahala |
| **Country** | India |
| **Education** | M. Sc. (Environmental Mgmt), GGSIP University<br>B.Sc. Honour (Chemistry), Sri Venkateshwar College, DU |
| **Experience** | 2 Years + |
| **Field** | Climate Change |
| **Approved Roles** | |
| **Team Leader** | YES |
| **Validator** | YES |
| **Verifier** | YES |
| **Methodology Expert** | ACM0002, AMS.I.D., AMS.I.A, AMS.III.AV, AMS.II.G |
| **Local expert** | YES (India) |

| | | | |
|---|---|---|---|
| **Financial Expert** | NO | | |
| **Technical Reviewer** | NO | | |
| **TA Expert** | YES (TA 1.2 & TA 3.1) | | |
| | | | |
| **Reviewed by** | Abhishek Mahawar | **Date** | 01/03/2018 |
| **Approved by** | Ashok Kumar Gautam | **Date** | 01/03/2018 |

| **Competence Statement** | | | |
|---|---|---|---|
| **Name** | Shreya Garg | | |
| **Country** | India | | |
| **Education** | M.Sc. (Climate Science & Policy), TERI University | | |
| **Experience** | 6 Years + | | |
| **Field** | Climate Change | | |
| **Approved Roles** | | | |
| **Team Leader** | YES | | |
| **Validator** | YES | | |
| **Verifier** | YES | | |
| **Methodology Expert** | AMS.I.A., AMS.I.C., AMS.I.D., AMS.I.F., AMS.II.D., AMS.II.G., AMS.II.J., AMS.III.AV., ACM0002, ACM0012 | | |
| **Local expert** | YES (India) | | |
| **Financial Expert** | NO | | |
| **Technical Reviewer** | YES | | |
| **TA Expert** | YES (TA 1.2, TA 3.1) | | |
| | | | |
| **Reviewed by** | Abhishek Mahawar | **Date** | 01/03/2018 |
| **Approved by** | Ashok Gautam | **Date** | 01/03/2018 |

| **Competence Statement** | | | |
|---|---|---|---|
| **Name** | Shifali Guleria | | |
| **Education** | M.Sc. (Environmental Studies and Resource Management), TERI University | | |
| **Experience** | Few months | | |
| **Field** | Climate Change | | |
| **Approved Roles** | | | |
| **Team Leader** | NO | | |
| **Validator** | NO | | |
| **Verifier** | NO | | |
| **Methodology Expert** | NO | | |
| **Local expert** | NO | | |
| **Financial Expert** | NO | | |
| **Technical Reviewer** | NO | | |
| **TA Expert (X.X)** | NO | | |
| **Trainee** | Validator/ Verifier | | |
| | | | |
| **Reviewed by** | Shreya Garg (Quality Manager) | **Date** | 01/07/2018 |
| **Approved by** | Anshika Gupta (Technical Manager) | **Date** | 01/07/2018 |

| 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** | 01/03/2018 |
| **Approved by** | Ashok Kumar Gautam | **Date** | 01/03/2018 |

# Appendix 3. Documents reviewed or referenced

| No. | Author | Title | References to the document | Provider |
|---|---|---|---|---|
| 1 | EIL<br>EIL | Registered PoA-DD<br>Revised accepted PoA-DD | V 3.2 dated 27/11/2012<br>V 4.3, dated 07/06/2014 | Other |
| 2 | GL<br>CarbonCheck | Validation Report (registered PoA-DD)<br>Revised Validation Report PRC | V11, dated 05/12/2012<br>V 3, dated 11.06/2014 | Other |
| 3 | EIL | 5342-0004 CPA DD | V 6.1, dated 11/09/2014 | Other |
| 4 | EIL | 5342-0005 CPA DD | V 6.1, dated 11/09/2014 | Other |
| 5 | CarbonCheck | 5342-0004 validation report | V04, dated 23/09/2014 | Other |
| 6 | CarbonCheck | 5342-0005 validation report | V04, dated 23/09/2014 | Other |
| 7 | UNFCCC | Methodology AMS II G | Version 3 | Other |
| 8 | EIL | Monitoring report (Publication) | V1, dated 12/05/2017 | CME |
| 9 | EIL | Monitoring report (Final version) | Version 4.0 dated 24/01/2019 | CME |
| 10 | EIL | ER calculation sheet (Initial) | Pertaining to initial MR | CME |
| 11 | EIL | ER calculation sheet (Final) | Pertaining to final MR | CME |
| 12 | IPCC | IPCC Defaults | 2006 | Other |
| 13 | UNFCCC | CDM VVS for PoA | version 1.0 | Other |
| 14 | UNFCCC | CDM PS for PoA | version 1.0 | Others |
| 15 | UNFCCC | CDM PCP for PoA | version 1.0 | Others |
| 16 | UNFCCC | Standard: Sampling and surveys for CDM project activities and programme of activities | 7 | Others |
| 17 | UNFCCC | Guideline: Sampling and surveys for CDM project activities and programme of activities | 4.0 | Others |
| 18 | UNFCCC | Data available here : | - | |

| | | | | |
|---|---|---|---|---|
| | | http://cdm.unfccc.int/Panels/ssc_wg/meetings/037/ssc_37_an14.pdf | | |
| 19 | Global Alliance of Clean Stoves | country profile provided by Global Alliance for Clean Cookstove (http://www.cleancookstoves.org/countries/africa/nigeria.html) | - | |
| 20 | UNFCCC | CDM-PoA-MR-FORM | Version 2.0 | Others |
| 21 | ESPL | Verification report for MP4 | Version 1.0 dated 19/07/2017 | Others |
| 22 | Envirofit | Manufacturer's specification- M5000, CH2300, CH5300 | - | CME |
| 23 | Envirofit | ICS sales database for CPA #4 and CPA#5 | - | CME |
| 24 | Envirofit | Monitoring Survey Training Presentation | - | CME |
| 25 | UNFCCC | UNFCCC webpage for PoA 5342 http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/4R62VM8H3CFJDZTAXYQEL7I19NBPWO/view | - | Others |
| 26 | Envirofit | WBT records for CPA #4 | - | CME |
| 27 | Envirofit | WBT records for CPA #5 | - | CME |
| 28 | PCIA | PCIA website http://www.pciaonline.org/testing | - | Others |
| 29 | Envirofit | WBT excel sheet | - | CME |
| 30 | Envirofit | Monitoring survey excel sheets | - | CME |
| 31 | Envirofit | Filled monitoring survey forms | - | CME |
| 32 | SELFA | Calibration certificate for thermometers and weighing balance | Dated 08/05/2018 | CME |
| 33 | SELFA | Calibration certificate for weighing balance | Dated 08/05/2018 | CME |
| 34 | TROTEC | Manufacturer's specification of moisture meter | - | CME |
| 35 | Omega | Manufacturer's specification of thermometer | - | Other |
| 36 | KERN | Manufacturer's specification of weighing balance | - | Other |
| 37 | Stat Trek | Snapshot of random numbers for CPA004 and CPA005 | 16/02/2018 | CME |

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

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

| **FAR ID** | NA | **Section No.** | | **Date :**DD/MM/YYYY |
|---|---|---|---|---|
| **Description of FAR** | | | | |
| There is no finding from validation /5,6/ or previous verification report/21/. | | | | |
| **Project participant response** | | | | **Date :**DD/MM/YYYY |
| - | | | | |
| **Documentation provided by project participant** | | | | |
| - | | | | |
| **DOE assessment** | | | | **Date:** DD/MM/YYYY |
| - | | | | |

**Table 2. CL from this verification**

| **CL ID** | 01 | **Section no.** | E.3.5.1 | **Date :**03/08/2018 |
|---|---|---|---|---|
| **Description of CL** | | | | |
| Achieved Emission reduction in the ER submitted to the DoE is 21,595 tCO2, which is significantly lower than the achieved emission reduction written in the published MR (88,318). PP shall explain the reason for the difference. | | | | |
| **Project participant response** | | | | **Date :**16/08/2018 |

| |
|---|
| The values published in MR were ex-ante values, specified as a matter of oversight. The MR has been revised to mention the ex-post actual achieved ER volumes i.e. 21,582 $tCO_2e$ |
| **Documentation provided by project participant** |
| CDM PoA 5342 MP#5 Nigeria MR version 2.0 19072018<br>CDM PoA 5342 MP#5 Nigeria ER calculator version 2 19072018 |
| **DOE assessment** **Date:** 20/08/2018 |
| Since the value of achieved emission reductions in the published MR is the same as ex-ante estimated value of CERs, the explanation given by the PP was found to be satisfactory.<br><br>Therefore, the CL stands closed. |

| | | | | |
|---|---|---|---|---|
| **CL ID** | 02 | **Section no.** | E.3.1 and E.2.1 | **Date :**03/08/2018 |
| **Description of CL** | | | | |
| PP shall add technical description of the stoves under section C.1 and provide evidence for the same. | | | | |
| **Project participant response** | | | | **Date :** 16/08/2018 |
| The MR has been revised to add the requested information. The stove specifications are being submitted. | | | | |
| **Documentation provided by project participant** | | | | |
| CDM PoA 5342 MP#5 Nigeria MR version 2.0 19072018<br>Stove Specification Sheets - CH2300, CH5300, M5000 | | | | |
| **DOE assessment** | | | | **Date:** 20/08/2018 |
| Latest version of MR submitted by the PP includes technical specifications of stoves and corresponding evidence has been provided as requested.<br><br>Therefore, the CL stands closed. | | | | |

**Table 3. CAR from this verification**

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 03 | **Section no.** | E.3.4.2.1 | **Date : 03/08/2018** |
| **Description of CAR** | | | | |
| Site visit observation:<br>1. For household names Mrs Ganiyu, old unique ID. EC1H094274 and new stove with unique ID EC1H094336 and Mrs. Oyewole, old unique ID EC1H093746 and new stove (EC1H058443)<br>the owner was found to have a replaced stove. However, no such information was found in survey forms or CPA distribution database. | | | | |
| **Project participant response** | | | | **Date :** 16/08/2018 |
| Mrs. Ganiyu stove was picked for WBT hence a new stove unit (against picking their stove unit for WBT) was provided to her for cooking.<br>For Mrs. Oyewole, at the time of survey the stove handles were found damaged which made shifting stove from one point to another very difficult. Hence the user was also provided with a new stove.<br><br>The record of all original stoves picked up for testing (WBTs) or otherwise, and the serial number of replacement stoves provided to the corresponding users is being submitted. | | | | |
| **Documentation provided by project participant** | | | | |
| List of stove units picked Vs new units distributed while monitoring | | | | |
| **DOE assessment** | | | | **Date:** 20/08/2018 |
| The list submitted by the PP confirms that stoves of the beneficiary in question were replaced. Justification given by the PP is found to be satisfactory.<br><br>Therefore, the CAR stands closed. | | | | |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 04 | **Section no.** | E.2.3.5. | **Date :**03/08/2018 |
| **Description of CAR** | | | | |
| As per para 261 of PS for PoA version 1.0, the coordinating/managing entity shall indicate whether there are any temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines, or corrections or permanent changes to the PoA or to the included CPAs hereinafter referred to as post-registration changes). For post-registration changes that have been approved by the Board, the coordinating/managing entity shall indicate the dates of approval.<br>It was checked from the CDM website that the PoA has undergone a post registration change.<br>http://cdm.unfccc.int/PRCContainer/DB/prcp237694862/view<br><br>However, no information about the PRC has been mentioned in the MR. | | | | |
| **Project participant response** | | | | **Date :** 16/08/2018 |

| |
|---|
| The MR has been revised to mention information about approved PRC |
| **Documentation provided by project participant** |
| CDM PoA 5342 MP#5 Nigeria MR version 2.0 19072018 |
| **DOE assessment** **Date:** 20/08/2018 |
| Information about approved PRC has been added to MR version 2.0.<br><br>Therefore, the CAR stands closed. |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 05 | **Section no.** | E.3.4.4 | **Date :**03/08/2018 |
| **Description of CAR** | | | | |
| As per para 264, PS for PoA, describe the equipment used to monitor each parameter, including details on accuracy class, and calibration information (frequency, date of calibration and validity), if applicable as per the registered monitoring plan;<br><br>PP shall mention the information related of the calibration of all the equipment used for monitoring. | | | | |
| **Project participant response** | | | | **Date :** 16/08/2018 |
| The information relating to the equipment used for monitoring has been added to the MR. The information related to their calibration status is being submitted. | | | | |
| **Documentation provided by project participant** | | | | |
| Monitoring equipment specifications<br>Calibration documents / invoice for monitoring equipment | | | | |
| **DOE assessment** | | | | **Date:** 20/08/2018 |
| The information regarding the equipment used for monitoring was found in the latest version of MR submitted by the PP and corresponding evidences about calibration were also submitted as requested.<br><br>Therefore, the CAR stands closed. | | | | |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 06 | **Section no.** | E.3.4.2 | **Date :**03/08/2018 |
| **Description of CAR** | | | | |
| **Monitoring report**:<br>1. There are several inconsistencies between the ER sheet and the MR. Please refer to the commented MR.<br>2. Page 12 of the MR mentions, “The parameter value for Charcoal is deemed as zero as during monitoring, none of the charcoal stove sampled user were found using baseline stoves i.e.$f_{old\ Charcoal}$ = 0”. This statement was found to be incorrect with respect to the monitored data. | | | | |
| **Project participant response** | | | | **Date :** 16/08/2018 |
| 1. The inconsistencies between the ER sheet and MR sheet have been rectified.<br>2. This cited text was left over from last year’s monitoring report. The MR has been revised to remove the same. | | | | |
| **Documentation provided by project participant** | | | | |
| CDM PoA 5342 MP#5 Nigeria MR version 2.0 19072018 | | | | |
| **DOE assessment** | | | | **Date:** 20/08/2018 |
| 1. All inconsistencies between ER sheet and MR were found to be appropriately addressed and the hence, the finding is closed.<br>2. The revision made in MR was found to be appropriate and satisfactory. Closed.<br><br>Therefore, the CAR stands closed. | | | | |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 07 | **Section no.** | E.3.4.2 | **Date :**03/08/2018 |
| **Description of CAR** | | | | |
| **WBT calculation sheet:**<br>1. Several values in the WBT summary sheet are inconsistent with the WBT forms submitted to the DoE. For eg. Cell G6, K11, K17, U6.etc. please refer the commented WBT summary sheet.<br>2. In Cell D71, unique ID mentioned in inconsistent with the monitoring survey form.<br>3. Source of the values in column O and column AF could not be traced. | | | | |
| **Project participant response** | | | | **Date :** 16/08/2018 |

1. The WBT calculator has been made consistent with the values in the WBT forms.
2. The unique ID of the stove has been corrected as per that of the WBT form
3. Column O and AF are average values of moisture content based on values specified in column AQ:BH

**Documentation provided by project participant**

CDM PoA 5342 MP#5 Nigeria ER calculator version 2 19072018
CDM PoA 5342 MP#5 Nigeria WBT version 2.0 16082018

**DOE assessment** | **Date:** 20/08/2018

All discrepancies in the WBT calculator were accurately made consistent with WBT forms. The calculation of moisture content was also made clear and traceable.

Therefore, the CAR stands closed.

| **CAR ID** | 08 | **Section no.** | E.3.5.1 | **Date :**03/08/2018 |
|---|---|---|---|---|

**Description of CAR**

**ER sheet:**

1. In the sheet titled “Monitoring Survey Summary”, cell W120, the date of discontinuation has not been mentioned.
2. Sheet titled “Sample size calculations”, Cell B12, the sampling frames mentioned, do not include stove model CH5300.
3. entries in Sheet titled “Monitoring survey Summary”, cell AF18 are AI 115 are inconsistent with the monitoring survey forms.
4. Sheet titled “Monitoring survey Summary”, Cell AA60, have unique ID inconsistent with the CPA database.
5. Unique ID mentioned in Sheet titled “Monitoring survey Summary”, Cell AA65, could not be found in the CPA distribution database.
6. PP shall add the calculation of ex-ante emission reduction in the ER sheet.

**Project participant response** | **Date :** 16/08/2018

**ER sheet:**

1. The date of discontinuation of stoves for users that have stopped using ICS has been removed from the ER sheet as this is a non-activity parameter. Moreover, any sampled user reporting not using the stove, has been considered as not operational for the entire monitoring period and SoF has been calculated accordingly.
2. Sheet titled “Sample size calculations”, Cell B12, has been revised to mention all the three sampling frames.
3. Entries in Sheet titled “Monitoring survey Summary”, have been made consistent with the monitoring survey forms.
4. The unique ID in “Monitoring survey Summary”, cell AA60 has been made consistent with CPA-database
5. As a conservative approach, if a household is found using more than 1 EF stove, the same is considered for discounting the total population ($N_{all}$), irrespective of the presence of the subsequent stove in the database.
6. The calculation of ex-ante emission reduction in the ER calculator

**Documentation provided by project participant**

CDM PoA 5342 MP#5 Nigeria ER calculator version 2 19072018

**DOE assessment** | **Date:** 20/08/2018

1. Since the stoves which have been reported to be discontinued are considered non-operational for the entire monitoring period and not included in the calculations, the date of discontinuation can be considered a non-activity parameter, thus justifying the removal of this parameter from the ER sheet. Therefore, the explanation was found satisfactory and the finding is closed.
2. The revision has accurately been made and model CH5300 has been added to the sampling frame in the latest version of ER sheet. Hence, closed.
3. Entries were found to be made consistent in the latest version of ER sheet and hence, the finding is closed.
4. The inconsistency has been addressed and found appropriate. Therefore, the finding is closed
5. The explanation given by the PP was found to be appropriate. The finding is closed.
6. The calculation of ex-ante emission reduction were found to be added in the latest version of ER sheet by the PP.

Therefore, the CAR stands closed.

| **CAR ID** | 09 | **Section no.** | E.3.4.3. | **Date :10/10/2018** |
|---|---|---|---|---|

| Description of CAR |
|---|
| The PoA-DD establishes that the sampling plan shall have sampling frames taking into account country, fuel type, user and stove type. Three sampling frames were established to determine parameter 'Efficiency of the system being deployed as part of the project activity'. However, for the other parameters (Stove operation factor; Fraction of end users that are still using baseline stoves; and the amount of woody biomass consumption that is consumed through the continued use of old stoves), there were only two sampling frames, one for charcoal and one for woodfuel. It has not been demonstrated that:<br>i. The efficiency of the two types of charcoal stoves are within +/-10%. As per the specification, efficiency of stove CH5300 is 35.7%. The +/-10% range of this efficiency would be 32.13% - 39.27%, whereas the efficiency of stove CH2300 is 39.4%;<br>ii. The two types of charcoal stove have the same feature. The PoA-DD has provided an example of two types of stove having the same efficiencies, but they are considered different due to the suitability of different shape of pot's bottom. Furthermore, it is observed from the figures in page 6 of the monitoring report that CH5300 stove has air grill whereas CH2300 stove does not. Please refer to paragraph 345 of VVS-PoA (version 01.0). |

| Project participant response | Date : 26/10/2018 |
|---|---|

The PoA-DD on page 57 states the following:

> *Stove types can be treated as sufficiently homogenous (referred to below as "similar") provided that their efficiencies are in a similar range defined as being within +/-10% of each other and they have other common design features. This means differentiating between fixed vs portable stoves, stoves with a capacity designed for households vs institutional users, and potentially other design features that could impact on end user preferences.*

The charcoal stoves that have been monitored under the MP#3 are CH5300 (distributed during 2016 - 2017) and CH2300 (distributed during 2013 - 2017). Thus, it not appropriate to consider their design rated efficiency (as specified on page 6 of MR) for the purpose of determining sampling frames. Instead, the PP, in line with the para 12(b) and 12(c) of the "Standard: Sampling and surveys for CDM project activities and programmes of activities", Version 07.0, determined the expected thermal efficiency values (mean, standard deviation) based on its knowledge and experience given ICS were distributed over a longer time frame and will not be performing at the design / rated efficiency levels.

The PP therefore considered the expected efficiency of CH2300 as 31% and that of CH5300 as 32% (lower than the rated efficiency). These values are within the +/-10% range, for them to be considered under one sampling frame for other monitoring parameters. The appropriateness of the assumptions is further substantiated by the monitoring results which yield a thermal efficiency value of 31.01% for CH2300 and 32.59% for CH5300, which are well within the +/-10% range of each other.

Also, in terms of design features these ICS are not deemed to differ as they both correspond to portable stove type with capacity designed for domestic usage. The air ring provided in case of CH2300 only provides for a stable base to keep the pot as well as allows the flames and gases to move up by creating a natural draught. In CH5300 the same provision has been made via the top cast iron plate with 3 inner pot rests at an angle of 120 degrees with each other (refer image on page 6 of MR) for smaller pots and 6 outer pot rests at an angle of 60 degrees with each other for larger pots. The other visible difference is that CH2300 has a bottom ash collection area which can be emptied after the cooking event whereas CH53300 has an ash tray which can be emptied by pulling it out. Also, the combustion chamber technology in these stoves are identical Again this does not change any end user preferences which are primarily, based on fuel type (charcoal vs woodfuel), stove type (fixed vs portable) and service level type (domestic vs institutional).

It should be noted that the physical appearance of stove models does not impact their homogeneity, as this is proved by the type (charcoal/fuelwood, fixed/portable) and level of service (domestic / institutional) provided. Thus, by virtue of their design these charcoal stove models are considered homogenous and not impacting any end user preferences and hence have been clubbed into one sampling frame in line with PoA-DD.

| Documentation provided by project participant |
|---|
| - |

| DOE assessment | Date: 26/10/2018 |
|---|---|

i. The CME has considered expected efficiency of CH2300 as 31% and that of CH5300 as 32% (lower than the rated efficiency) based on para 12 of the Standard: Sampling and surveys for CDM project activities and programmes of activities for sample size calculations. The monitoring results also yielded very similar values (thermal efficiency value of 31.01% for CH2300 and 32.59% for CH5300) compared to that initially expected for sample size calculations. The monitoring results also show that thermal efficiency values for these stoves are within +/-10% of each other. Thus, it complies PoA DD requirement and considering these two types of stoves in one frame was deemed to be correct

ii. The air ring in the model CH2300 only provides stability and does not impact efficiency or any other design feature. Both the stoves are portable, designed for household users, and have similar designs, thus, it complies PoA DD requirement. Therefore, considering these two types of stoves in one frame was deemed to be correct.

Thus, the CAR stands closed.

| **CAR ID** | 10 | **Section no.** | E.3.4.4. | **Date : 10/10/2018** |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| As per the MR, the surveys and WBTs were conducted during March - May 2018. The PP needs to clarify how it concluded that the devices were duly calibrated prior to the water boiling test survey reported in the survey forms, as the mini-thermometer and mass balance were calibration on 08/05/2018. | | | | |
| **Project participant response** | | | | **Date :** 26/10/2018 |
| The surveys were conducted in March – April 2018 and subsequently the WBTs were conducted in May 2018. The first WBT was conducted on 18 May 2018 which is after the date of calibration of the mini thermometer and mass balance | | | | |
| **Documentation provided by project participant** | | | | |
| - | | | | |
| **DOE assessment** | | | | **Date:** 26/10/2018 |
| The date of first WBT was confirmed from the WBT records for CPA#4 and CPA#5. The date of first WBT is 18/05/2018 which is clearly after the date of calibration of the instruments used. Thus, it can be confirmed that the WBTs have been conducted with calibrated instruments.<br><br>Thus, the CAR stands closed. | | | | |

| **CAR ID** | 11 | **Section no.** | E.3.4.2.2. and E.3.4.1.1. | **Date : 10/10/2018** |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| Some households are observed having more-than-one stoves as per the 'CPA Distribution Data'. For example, the same households (referring to the same CUSTOMER NAME, same CUSTOMER ADDRESS, same CITY OR VILLAGE, same TELEPHONE NUMBER) are observed to have 5 stoves, 8 stoves, 18 stoves, or even 41 stoves (i.e. MRS O.K ROTIMI). The parameter ex-ante parameter $Q_{biomass}$ (Annual average biomass consumption per appliance, i.e. 4.94 and 4.50 Tonne/year/stove for CPA4 and CPA5 respectively) was determined based on biomass consumption at household level. For example, in CPA4, the value 4.94 was calculated from average fuelwood consumption per capita of 0.99 tonne/y, multiplied by average size household in Nigeria of 5 persons/household. The resulting unit of this calculation would be 'tonne/y/household'. However, unit of this parameter the CPA-DDs is 'tonne/y/stove', which implies that there will be one stove per household. Given the fact above, the PP shall provide information on how it has verified the appropriateness of applying the values 4.94 and 4.50 Tonne/year/stove for CPA4 and CPA5 respectively in determining the emission reductions. Please refer to paragraph 358(d) of VVS-PoA (version 01.0). | | | | |
| **Project participant response** | | | | **Date :** 26/10/2018 |

More than one ICS on a single user name need not necessarily indicate them being in the same household, despite having the same user name, address and contact detail. It is a feature of last-mile distribution programmes in frontier markets that retailers of cookstoves must respond the nature of demand – that is, would a retailer refuse a sale of 40 cookstoves to the representative of a group of buyers because that representative cannot provide personal data of each of the end users? The answer is of course no, but this does not mean that the cookstoves are not valid for crediting under the CPA, because:

a. Often, people buy additional ICS units to give it to their immediate relatives as gift, resulting in more than one ICS on a given name.
b. Groups of end-users buy together via a single representative, for additional discounts (bulk order discounts), at the point of retail and hence multiple stoves might be listed on a single given name in the database despite being distributed to different households in the neighbourhood.
c. In case of donor / sponsored programs, the ICS are disseminated to different users but are owned by the donor / sponsor hence bear a common name in the database.
d. In case of rented living / slum developments, the ICS might be bought by landlords for a number of their quarters each of which will have one stove. Hence the stove ownership lies with the landlord, but the usage is in different households. In such cases, the database may list the ICS with the landlord as the owner of the ICS.
e. In some cases, the end user may not wish to share their private details and hence instead share the detail of the local representative like village head or the retailer from whom they have purchased the stove.

In all the above cases, although the actual end user is not listed in the database, it is possible to track them uniquely via the ICS serial number and contacting the buyer / owner.

There are also checks on this in the monitoring plan. Page 47 of the PoA-DD, under the monitoring parameter table for $N_{all}$ refers to discounting additional stoves found in a sampled household, at the time of monitoring, from the population. At the time of monitoring, the PP checks if there are multiple ICS in use in each sampled household and the presence of any additional stove is recorded. The percentage of users found having more than one ICS in the household is used to discount such multi-use scenarios from the total stove population, ensuring that only ICS per household is credited.

Please refer the ER Calculator, tab “Monitoring Survey Summary”. In columns R:V, presence of more than one ICS in the sampled household is being monitored and if applicable, the same is being used to discount the total number of ICS ($N_{all}$) in the tab “ER Calculations”, cell B29 and C29 for CPA04 and CPA05 respectively. Thus, the total population has been discounted by the % of sampled household reporting using more than 1 ICS, to ensure that only 1 stove is credited per households as a conservative measure.

**Documentation provided by project participant**

| **DOE assessment** | **Date:** 26/10/2018 |
|---|---|

The above listed reasons for observing more than one stove installed under one end users were found to be relatable to actual scenario on field and acceptable. Additionally, the PP has adjusted the final value of $N_{all}$ for proportion of monitored samples which were found to have more than one stove. The approach was found to be in line with the registered monitoring plan (PoA DD, page 47)

Thus, the CAR stands closed.

**Table 4. FAR from this verification**

| **FAR ID** | 12 | **Section No.** | E.3.4.2.2. | **Date :**23/01/2019 |
|---|---|---|---|---|

**Description of FAR**

The verifying DoE shall ensure that the CME has considered only those stoves to claim emission reduction for which end user data available.

| **Project participant response** | **Date :**DD/MM/YYYY |
|---|---|

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**Documentation provided by project participant**

| | |
|---|---|
| - | |
| **DOE assessment** | **Date:** DD/MM/YYYY |
| - | |

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## Document information

| *Version* | *Date* | *Description* |
|---|---|---|
| 02.0 | 29 December 2017 | Revision to align with the requirements of the "CDM validation and verification standard for programme of activities" (version 01.0). |
| 01.0 | 5 June 2015 | Initial publication. |

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

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| | | | Name | Date | Name | Date |
| 1.0 | 04/05/2018 | Guidelines updated | Shreya Garg | 04/05/2018 | Anshika Gupta | 04/05/2018 |
| **This table is for ESPL internal document control purpose only* | | | | | | |