# DISTRIBUTION OF ONIL STOVES GUATEMALA USPANTÁN CPA 001

Document Prepared By Ang Kong Nian

C-Quest Capital Malaysia Limited

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|---|---|
| **Project Title** | Distribution of ONIL Stoves Guatemala Uspantán CPA 001 |
| **Version** | 01 |
| **Date of Issue** | 17-August-2017 |
| **Monitoring Period** | 19-December-2010 to 31-July-2017 |
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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Project and its Implementation Status

- **A summary description of the technologies/measures (eg, plant, equipment, process, or management or conservation measure) included in the project and the status of their implementation.**

  The project involves the distribution and installation of ONIL Stoves for use by households in Guatemala. Before the adoption of the ONIL Stove, households in Guatemala used inefficient, conventional open fire. The ONIL Stove is a fuel-efficient stove that reduces the amount of firewood required by households by up to 58%, compared to the baseline, and results in lower emissions based on its construction. A single ONIL Stove will save 3.837 tons of $CO_2e$ per year.

  The project was included as the first CPA under CDM PoA entitled Distribution of ONIL Stoves – Guatemala" (CDM PoA reference number - 8480, CPA reference number – 8480-0001).[1]

  The first ONIL Stove was installed on 15 March 2010. Till the end of monitoring period, a total of 11,132 ONIL Stoves was reported installed under the project.

  All the data recorded during stove registration process was captured via hard copy of registration card. The information collected is then transferred to a project database.

- **The relevant implementation dates (eg, dates of construction, commissioning, and continued operation periods).**

  CDM CPA inclusion

| | |
|---|---|
| Date of CPA inclusion into PoA | 19-December-2012 |

  Installation of ICS

| | |
|---|---|
| Date of first ICS installed | 15-March-2010 |
| Date of last ICS installed in the database | 11-August-2012 |

  First Monitoring Survey

| | |
|---|---|
| Survey dates for parameters $n_y$ and $SS_y$ | 01-February-2017 to 28-March-2017 |
| Survey dates for parameter $\eta_{new,y,i}$ | 28-February-2017 to 16-March-2017 |

- **An explanation of how the project is expected to generate GHG emission reductions or removals.**

  The replacement of conventional open fire with more efficient devices in households reduces the amount of fuel wood consumption through improved combustion efficiency,

[1] https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

thus reducing the GHG emissions linked to non-renewable biomass and incomplete combustion of fuel wood.

- **The location of the project.**

  The project will take place in Guatemala. The details of the project location are provided in Section 1.9.

- **A brief description of the scenario existing prior to the implementation of the project.**

  The scenario existing prior to project initiation are the same as the baseline scenario. See Section 2.4.

- **Where applicable, describe how leakage and non-permanence risk factors are being monitored and managed for AFOLU projects**.

  Not applicable. The project is not a type of AFOLU project.

- **An estimate of annual average and total GHG emission reductions and removals for the project crediting period.**

  The details are given under Section 1.7.

- **The total GHG emission reductions or removals generated in this monitoring period**.

  The project results in a total emission reduction of 195,765 $tCO_2e$ over the monitoring period of 19 December 2010 to 31 July 2017.

## 1.2 Sectoral Scope and Project Type

The project is categorised under type/category as below:

**a) Sectoral scope**: 03 - Energy demand

**b) Type:** I – Energy efficiency improvement projects

The project is not a grouped project.

## 1.3 Project Proponent

| | |
|---|---|
| Organization name | HELPS International Incorporated |
| Contact person | Mr Richard Grinnell |
| Title | Director of Stove Project and Vice President of International Development |
| Address | Calzada Atanasio Tzul 21-00 Zona 12, Complejo Empresarial El Cortijo II, Bodega 517, Guatemala. |
| Telephone | 011(502) 2428-6600 |
| Email | richardgrinnell@helpsinternational.com |

## 1.4 Other Entities Involved in the Project

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

## 1.5 Project Start Date

The start date of this project is January 11, 2010, which is the date when ONIL were first delivered (implementation) after the POA and its first CPA were published for Global Stakeholder Consultation at the UNFCCC website. [2]

## 1.6 Project Crediting Period

19 December 2010 to 31 July 2017

## 1.7 Project Scale and Estimated GHG Emission Reductions or Removals

| Project Scale | |
|---|---|
| Project | X |
| Large project | |

| Year | Estimated GHG emission reductions or removals ($tCO_2e$) |
|---|---|
| Year 1 | 42,773 |
| Year 2 | 42,773 |
| Year 3 | 42,773 |
| Year 4 | 42,773 |
| Year 5 | 42,773 |
| Year 6 | 42,773 |
| Year 7 | 42,773 |
| **Total estimated ERs** | 299,411 |

[2] As per paragraph 3.11.9 of VCS Standard Version 3.7, "for projects registered under the CDM as a Program of Activities (PoA), each Component Project Activity (CPA) shall be registered with the VCS Program as a separate project accompanied by its associated Program of Activities Design Document… The project start date for such projects is the date on which the first activity under the Program of Activities began reducing or removing GHG emissions. Where the project start date is before 8 March 2011, validation shall be completed within four years of the project start date; (in this case, validation refers to validation of the first CPA under the associated PoA)".

| | |
|---|---|
| **Total number of crediting years** | 7 |
| **Average annual ERs** | 42,773 |

## 1.8 Description of the Project Activity

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

## 1.9 Project Location

Each SSC-CPA will contain a delineated set of households in which ONIL Stoves have been installed within Guatemala. (CPA Implementer) will record names of end-users and the exact location in the SSC-CPA in the program database. End-user names and locations and stove identification numbers will be collected on stove purchase contracts. The sum of the location of these households as within Guatemala, will define the spatial boundary of the SSC-CPA.

The key geographic location of the applied measure (improved cook stoves) is determined using the database of unique stove IDs, the household addresses, GPS coordinates and owners' names and national ID card numbers. These parameters uniquely identify the household. The CPA boundaries equal Guatemala's borders. The geographic coordinates for Guatemala, the CPA boundary, are: Northernmost point N 17° 48.744894' W 89° 9.902344 (*Reserva de la Biosfera Calakmul*), Westernmost point: N 14° 32.202449' W 92° 13.483887; Southernmost point: N 13° 45.280865'W 90° 7.910156 (*Carretera del Litoral);* Easternmost point: N 15° 43.469738' W 88° 13.872070(*Carretera 13*).

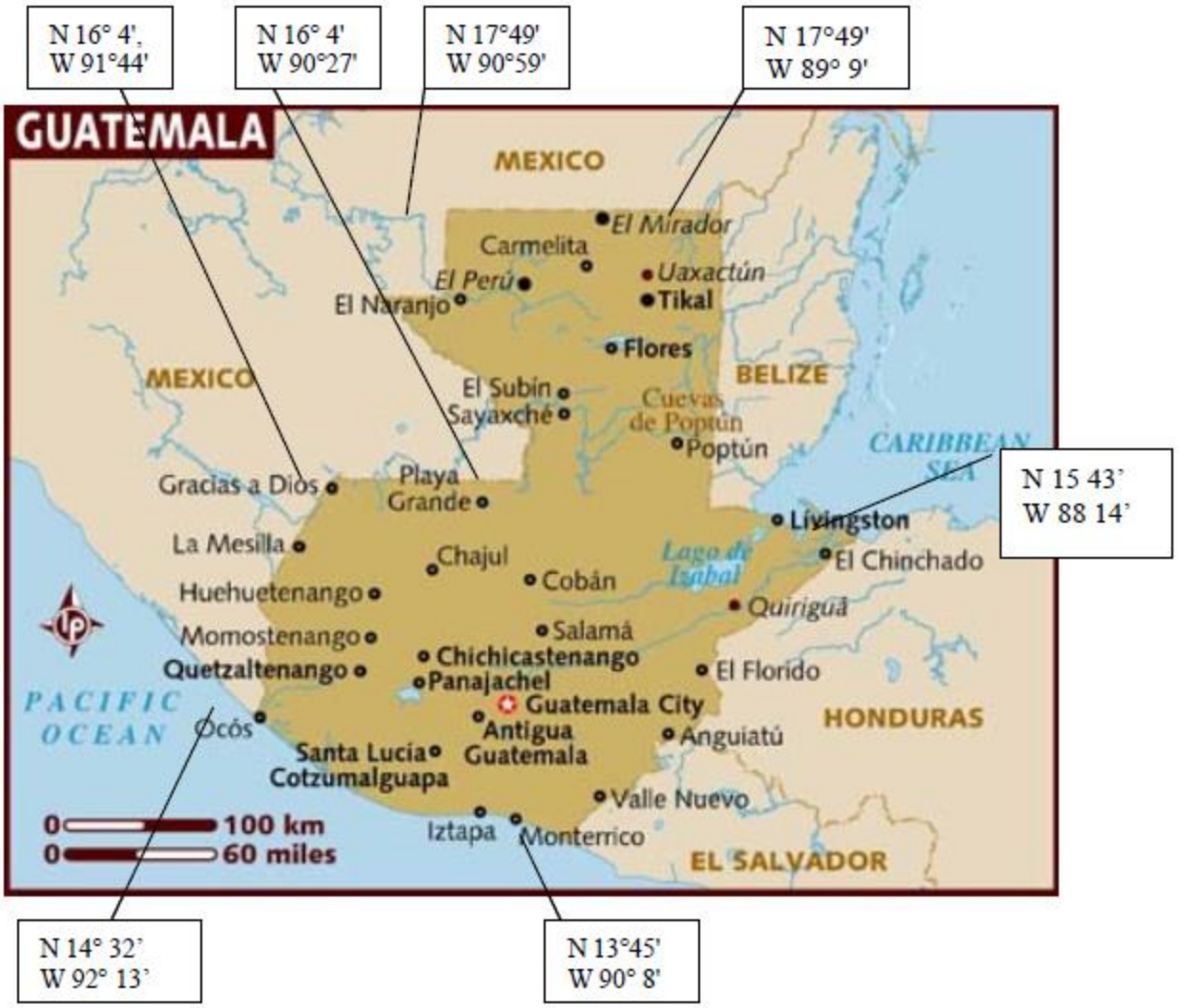


Figure 1. Map of Guatemala, Uspantán CPA[3]

## 1.10 Conditions Prior to Project Initiation

The conditions prior to project initiation are the same as the baseline scenario. See Section 2.4.

## 1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

[3] www.lonelyplanet.com/maps/central-america/guatemala/map_of_guatemala.jpg

## 1.12 Ownership and Other Programs

### 1.12.1 Project Ownership

The letters of Approval (LoA) from Guatemala and Netherlands have been provided to auditor as the proof of title of the project.

### 1.12.2 Emissions Trading Programs and Other Binding Limits

Not applicable. The project was registered under UNFCCC.

### 1.12.3 Other Forms of Environmental Credit

Not applicable.

### 1.12.4 Participation under Other GHG Programs

The project has been included under CDM POA (Reference number 8480).

### 1.12.5 Projects Rejected by Other GHG Programs

Not applicable

## 1.13 Additional Information Relevant to the Project

#### Eligibility Criteria

Not applicable. The project is not a grouped project

#### Leakage Management

As per AMS-II.G version 3 (paragraph 13), leakage related to the non-renewable woody biomass saved by the project activity shall be assessed based on ex post surveys of users and the areas from which this woody biomass is sourced (using 90/30 precision for a selection of samples). The potential source of leakage due to the use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources shall be considered. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass by the non-project households/users, that is attributable to the project activity, then $B_{old}$ is adjusted to account for the quantified leakage. Alternatively, $B_{old}$ is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

The project opts to apply a net to gross adjustment factor of 0.95 to account for leakages, thus no surveys on leakage are required.

#### Commercially Sensitive Information

No commercially sensitive information was excluded from the public version.

#### Sustainable Development

The following are contributions of the project to sustainable development:

**Environmental sustainability**
(i) The project reduces the use of non-renewable biomass:
By adopting the higher efficiency ONIL Stove, households reduce the quantity of fuel wood they must consume for daily cooking needs. When compared to firewood consumption of conventional open fires, the ONIL Stove on average reduces firewood consumption by 58 percent. Since a very high proportion of fuel wood comes from non-renewable sources, this translates directly into reduced emission reductions from non-renewable extraction of wood.

(ii) The project also supports the objectives of national climate change policies and programs.
The Programa Nacional de Cambio Climatico (PNCC) within the Environment Ministry of Guatemala is charged with assessing the risks of climate change and recommending policies to reduce the country's vulnerabilities. The project is in line with the PNCC aim of generating projects within Guatemala that promote forest management, a critical and vulnerable sector identified by the Program. By installing improved cook stoves, households reduce firewood consumption, thus helping maintain forest stocks within the country.

**Economic Sustainability**
(i) The project reduces household expenditures:
The PoA will contribute significantly to Guatemala economic sustainability through the more efficient use of firewood. Energy savings at both individual household and national levels make important contributions to their economic efficiency and sustainability. The use of the ONIL Stoves will reduce firewood consumption by approximately 58 percent from baseline consumption, significantly reducing household expenditures. By installing improved cook stoves, these households would save significantly on household expenditures related to firewood purchases along with saving time spent gathering firewood, which would free up time for households for other income generating activities. These savings would help improve living conditions for households in Guatemala.

(ii) The project results in creation of new jobs and development of new skill sets:
The ONIL Stove distribution program, which all CPAs will follow, relies on community organizers to facilitate demonstrations and organize training sessions. As these community organizers increase their knowledge about stoves, they often become professional installers and help maintain the stoves in their community. In addition, there are two stove-manufacturing facilities in Guatemala that employ about 20 people each. As uptake of stove technologies spreads, it will allow for expansion of manufacturing facilities to meet increased demand, thus generating more employment opportunities within the country.

**Social Sustainability**
(i) The project helps to improve health conditions:
There are very tangible and significant health benefits associated with the switch in technology from conventional open fires to improved cook stoves. Traditional cooking methods involve conventional open fires that result in the emissions of local pollutants such as carbon monoxide and particulate matter in often poorly ventilated rooms, which lead to respiratory problems. In addition, conventional open fires are frequent causes of burns and other injuries. Switching from conventional open fires to ONIL Stoves reduces the incidence of such injuries and health problems.

### Further Information

Not applicable.

# 2 APPLICATION OF METHODOLOGY

## 2.1 Title and Reference of Methodology

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

## 2.2 Applicability of Methodology

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

## 2.3 Project Boundary

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

## 2.4 Baseline Scenario

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

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## 2.5 Additionality

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

## 2.6 Methodology Deviations

Not applicable.

# 3 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

## 3.1 Baseline Emissions

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

## 3.2 Project Emissions

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

## 3.3 Leakage

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

## 3.4 Estimated Net GHG Emission Reductions and Removals

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

# 4 MONITORING

## 4.1 Data and Parameters Available at Validation

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

### 4.2 Data and Parameters Monitored

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

### 4.3 Monitoring Plan

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

## 5 SAFEGUARDS

### 5.1 No Net Harm

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

### 5.2 Environmental Impact

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

### 5.3 Local Stakeholder Consultation

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

### 5.4 Public Comments

The project was included under CDM PoA 8480 on 19-12-2012 with CPA reference number 8480-0001. According to paragraph 3.11.10 of VCS standard version 3.7, this section does not need to be completed. Please refer to CPA-DD at the website below:

https://cdm.unfccc.int/UserManagement/FileStorage/6M3UGFJRC8TBWP4DKQA2Y9ZXS0IH1L

# 6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

## 6.1 Data and Parameters Monitored

| Data / Parameter | $n_{y,j}$ |
|---|---|
| Data unit | Quantity |
| Description | Number of stoves still in operation during the monitoring period as determined by the monitoring survey. This includes total number of stoves installed in the entire project. |
| Value applied: | 8,611 |
| Comments | The percentage of stoves found to be still in operation is applied to the total number of stoves installed in the project (according to the ICS registration records in the monitoring database and the applicable sample frame). The proportion of sampled ICS found to be in operation during each monitoring period will be applied to the total number of stoves in the project when calculating emissions reductions.<br><br>The percentage of stove found to be still in operation is 77.36%, thus the number of stoves still in operation is determined as below<br><br>11,132 x 77.36% = 8,611 units |

| Data / Parameter | $t_{y,j}$ |
|---|---|
| Data unit | Fraction |
| Description | Fraction of monitoring period the stove is in operation (days in operation/total days in monitoring period) |
| Value applied: | Actual values are unique for each ICS.<br>Average for the project is 0.92 |
| Comments | - |

| Data / Parameter | $\eta_{new,y,i}$ |
|---|---|
| Data unit | Fraction |
| Description | Continuing efficiency of ICS |
| Value applied: | Vintage 1: 0.2533<br>Vintage 2: 0.2300 |

| | |
|---|---|
| | Vintage 3: 0.2186<br>Vintage 4: 0.2390<br>Vintage 5: 0.2305<br>Vintage 6: 0.2276<br>Vintage 7: 0.2214<br>Vintage 8: 0.2081 |
| Comments | - |

| Data / Parameter | $SS_y$ |
|---|---|
| Data unit | Percentage |
| Description | The percentage of ongoing baseline stove use within the population of in-use ICS during a monitoring period. |
| Value applied: | 24.78% |
| Comments | - |

| Data / Parameter | $B_{old,\ adjusted}$ |
|---|---|
| Data unit | Tonnes/year |
| Description | If baseline stoves continue to be used, adjustment ensures that fuel wood consumption of those stoves is excluded from $B_{old}$ |
| Value applied: | 6.1934 |
| Comments | - |

## 6.2 Baseline Emissions

### a) Formulae for emission reductions

As per the SSC-POA-DD, emission reductions for the SSC-CPA will be calculated according to the following formula:

$$ER_y = B_{y,savings} \times f_{NRBy} \times NCV_{biomass} \times EF_{projected\_fossilfuel} \times N_{y,I} \times L$$

Where:

| | |
|---|---|
| $ER_y$ | Emission reductions during the year y in $tCO_2e$ |
| $B_{y,savings}$ | Total biomass that is saved in tonnes during the monitoring year(*y*) per device |
| $f_{NRB,y}$ | Fraction of biomass saved by the project activity in year y that has been established as non renewable biomass |
| $NCV_{biomass}$ | Net calorific value of the non-renewable biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne) |
| $EF_{projected\_fossilfuel}$ | Emission factor for the substitution of non-renewable biomass by similar consumers. (IPCC default of 81.6 $tCO_2$/TJ ) |
| $N_{y,i}$ | Number of project devices of type i operating in year y |

L A net to gross adjustment factor (0.95 default).is applied above (equation (1) of AMS II.G, version 3) in order to adjust $B_{old}$ to account for leakages as per paragraph 13 (a) of the methodology.

**Calculating $B_{y, savings}$**

According to the AMS II.G (version 3) methodology, $B_{y,savings}$ may be calculated in a number of ways (as per Options 1, 2 and 3 in Paragraph 12) and this PoA will allow the use of Option 2 in CPAs under this POA.

Option 2.

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

Where:

$B_{old}$ Baseline Quantity of woody biomass used in the absence of the project activity in tonnes per device

$\eta_{old}$ Efficiency of the baseline system/s being replaced. The 0.10 default value is used as the replaced systems are three-stone fires or conventional systems lacking improved combustion air supply mechanism and flue gas ventilation system i.e., traditional stoves

$\eta_{new,y,i}$ Efficiency of the system being deployed as part of the project activity (fraction)

For the purposes of calculating ex-ante emission reductions a baseline adjustment factor has to be applied to Bold to account for fuel-wood used in a second stove. The baseline survey obtained the average amount of fuel wood used by households with ONIL stoves.

The percentage of households continuing to use a baseline stove in addition to an ONIL stove will be monitored in order to address paragraph 20 (b) of the AMS II.G (version 3) methodology. The monitored (ex-post) percentage of ONIL users continuing to use a baseline stove in addition to the ONIL stove (parameter $SS_y$) will be compared to the ex-ante percentage found in the baseline (17%). Bold will be adjusted accordingly based on the proportional $SS_y$ change. The parameter used to calculate ex-post $B_{y,savings}$ adjusted to account for households using ONIL Stoves and baseline stoves will be $B_{old, adjusted}$. This procedure is outlined here (in the formula below 'n' indicates the *oldest* ONIL stove vintage):

$$B_{y,savings} = B_{old,adjusted} \times \left[\sum_{i=1}^{n} N_{y,i}\left(1 - \frac{\eta_{old}}{\eta_{new,i}}\right)\right]$$

Where:

$N_{y,i}$ Total number of stoves in operation for a full monitoring period equivalent within each SSC-CPA

$\eta_{old}$ Efficiency of the baseline system/s being replaced. The 0.10 default value is used as the replaced systems are three-stone fires or conventional systems lacking improved combustion air supply mechanism and flue gas ventilation system i.e., traditional stoves.

$\eta_{new,i}$ Efficiency of the systems of vintage (*i*) being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.

**$B_{old,adusted} = B_{old} - 0.31 * SS_y / 0.172$**

and,

0.31 Amount of biomass used by baseline stoves in households having an ONIL stove and a baseline stove adjusted to the fraction of these households in the overall sample of ONIL households (7.08 Kg/household/day*365 days/year/1000Kg/ton *0.17) according to secondary stove use studies; in tons per year

0.172 Is the fraction of households in secondary stove use study that use baseline stoves along with ONIL Stoves

SSy Is the fraction of households with an ONIL stove that are also using baseline stoves. Calculated as: Total households with ONIL Stoves that use baseline stoves (BLS)/Total number of ONIL Stoves in sample;

**b) Calculation of emission reductions**

**Calculation of $B_{old,adjusted}$**

$$B_{old,adusted} = B_{old} - 0.31 * SS_y / 0.172$$

$B_{old,adjusted}$ = 6.64 – 0.31 * 0.2478/ 0.172
= 6.1934 tonnes/stove/year

**Calculation of $B_{y,savings}$**

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

Quantity of woody biomass saved in tonnes per stove in vintage 1

$B_{1,savings}$ = 6.1934 x [1 – (0.1/0.2533)]
= 3.7483 tonnes/stove/year

Quantity of woody biomass saved in tonnes per stove in vintage 2

$B_{2,savings}$ = 6.1934 x [1 – (0.1/0.2300)]
= 3.5006 tonnes/stove/year

Quantity of woody biomass saved in tonnes per stove in vintage 3

$B_{3,savings}$ = 6.1934 x [1 – (0.1/0.2186)]
= 3.3602 tonnes/stove/year

Quantity of woody biomass saved in tonnes per stove in vintage 4

$B_{4,savings}$ = 6.1934 x [1 – (0.1/0.2390)]
= 3.6020 tonnes/stove/year

Quantity of woody biomass saved in tonnes per stove in vintage 5

$B_{5,savings}$ = 6.1934 x [1 – (0.1/0.2305)]

= 3.5064 tonnes/stove/year

Quantity of woody biomass saved in tonnes per stove in vintage 6

$B_{6,savings}$ = 6.1934 x [1 – (0.1/0.2276)]
= 3.4722 tonnes/stove/year

Quantity of woody biomass saved in tonnes per stove in vintage 7

$B_{7,savings}$ = 6.1934 x [1 – (0.1/0.2214)]
= 3.3960 tonnes/stove/year

Quantity of woody biomass saved in tonnes per stove in vintage 8

$B_{8,savings}$ = 6.1934 x [1 – (0.1/0.2081)]
= 3.2172 tonnes/stove/year

**Emission reductions for each ONIL Stove**

$$ER_y = B_{y,savings} \times f_{NRBy} \times NCV_{biomass} \times EF_{projected\_fossilfuel} \times N_{y,i} \times L$$

The emission reductions shall be considered from the dates of warranty of each ONIL Stove. CME has opted to present the individual set of emission reductions calculation for each ONIL Stove in which the emission reductions obtained under each vintage will be presented separately. The full calculation of each ONIL Stove is available in Excel spreadsheet for sharing with DoE.

In this section, only one example of ER calculation will be provided. The example given is for ONIL Stove with barcode (serial number) 1911034825 which was registered under CPA 1 (8480-0001).

The details of registration record for ONIL Stove 1911034825 is as below.

| Stove vintage at start date of monitoring period | Stove vintage at end date of monitoring period | Warranty date | Serial number | User name |
|---|---|---|---|---|
| 1 | 8 | 15/03/2010 | 1911034825 | Maria Ichich |

Start date of monitoring period for the project = 19/12/2010
End date of monitoring period for the project =31/07/2017

Since the stove was registered on 15 Mar 2010, thus it is eligible to claim VER for full monitoring period which is from 19 Dec 2010 to 31 Jul 2017 and it covers vintages 1 to 8.

| Vintage | Period covered under each vintage for stove 1911034825 |
|---|---|
| Vintage 1 | 15/03/2010 to 14/03/2011 |
| Vintage 2 | 15/03/2011 to 14/03/2012 |
| Vintage 3 | 15/03/2012 to 14/03/2013 |
| Vintage 4 | 15/03/2013 to 14/03/2014 |
| Vintage 5 | 15/03/2014 to 14/03/2015 |
| Vintage 6 | 15/03/2015 to 14/03/2016 |
| Vintage 7 | 15/03/2016 to 14/03/2017 |
| Vintage 8 | 15/03/2017 to 14/03/2018 |

**Emission reductions achieved under Vintage 1**

Eligible period to claim VER under Vintage 1: 19/12/2010 – 14/03/2011 (0.24 year)

ERs = 3.7483 x 0.913 x 0.015 x 81.6 x 0.95 x 0.24
= **0.94 $tCO_2$**

**Emission reductions achieved under Vintage 2**

Eligible period to claim VER under Vintage 2: 15/03/2011 – 14/03/2012 (1 year)

ERs = 3.5006 x 0.913 x 0.015 x 81.6 x 0.95 x 1
= **3.72 $tCO_2$**

**Emission reductions achieved under Vintage 3**

Eligible period to claim VER under Vintage 3: 15/03/2012 – 14/03/2013 (1 year)

ERs = 3.3602 x 0.913 x 0.015 x 81.6 x 0.95 x 1
= **3.57 $tCO_2$**

**Emission reductions achieved under Vintage 4**

Eligible period to claim VER under Vintage 4: 15/03/2013 – 14/03/2014(1 year)

ERs = 3.6020 x 0.913 x 0.015 x 81.6 x 0.95 x 1
= **3.82 $tCO_2$**

**Emission reductions achieved under Vintage 5**

Eligible period to claim VER under Vintage 5: 15/03/2014 – 14/03/2015 (1 year)

ERs = 3.5064 x 0.913 x 0.015 x 81.6 x 0.95 x 1
= **3.72 $tCO_2$**

**Emission reductions achieved under Vintage 6**

Eligible period to claim VER under Vintage 6: 15/03/2015 – 14/03/2016 (1 year)

ERs = 3.4722 x 0.913 x 0.015 x 81.6 x 0.95 x 1
= **3.69 $tCO_2$**

**Emission reductions achieved under Vintage 7**

Eligible period to claim VER under Vintage 7: 15/03/2016 – 14/03/2017 (1 year)

ERs = 3.3960 x 0.913 x 0.015 x 81.6 x 0.95 x 1
= **3.61 $tCO_2$**

**Emission reductions achieved under Vintage 8**

Eligible period to claim VER under Vintage 8: 15/03/2017 – 31/07/2017 (0.39 year)

ERs = 3.2172 x 0.913 x 0.015 x 81.6 x 0.95 x 0.39
= **1.32 $tCO_2$**

**Total emission reductions achieved by the project**

To account for the losses of emission reductions (ERs) due to non-operational of ICS, the total of emission reductions achieved by each project will take into account the proportion of ONIL stove in operation which 77.36%.

The summary of total net ERs calculation is as below.

| Initial total ERs ($tCO_2$) | Calculation of net ERs | Net ERs (rounded down) ($tCO_2$) |
|---|---|---|
| 253,058.39 | 253,058.39 x 77.36% | 195,765 |

## 6.3 Project Emissions

Not applicable.

## 6.4 Leakage

Not applicable.

## 6.5 Net GHG Emission Reductions and Removals

| Year | Baseline emissions or removals ($tCO_2e$) | Project emissions or removals ($tCO_2e$) | Leakage emissions ($tCO_2e$) | Net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| 19/12/2010 to 31/07/2017 | 195,765 | 0 | 0 | 195,765 |
| **Total** | 195,765 | 0 | 0 | 195,765 |