PROGRAMME DESIGN DOCUMENT FORM FOR SMALL-SCALE CDM PROGRAMMES OF ACTIVITIES (F-CDM-SSC-PoA-DD) Version 02.0

PROGRAMME OF ACTIVITIES DESIGN DOCUMENT (PoA-DD)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

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Energy Efficient Cook stoves in South Africa
Version: 01
Dated: 11/04/2012

A.2. Purpose and general description of the PoA

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The intention of the proposed small scale Program of Activity ("hereafter SSC-PoA") involves the installation of energy efficient improved biomass based Improved Cooking Stoves (ICS) in the households of South Africa. It is also intended to expand the geographical scope of the PoA to the other SADC countries comprising of Angola, Bostwana, DRC, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Nambia, Seychelles, South Africa, Swaziland, Tanzania and Zambia at a later stage. The programme is named as "ECOS". Implementation of the proposed activity will reduce the usage of conventional fuels i.e. fuel wood mainly used for house hold activities. Also the GHG emission reductions occurring from the combustion of wood in energy improved version of cooker unit contribute to sustainable development. ICSs disseminated under this PoA are more efficient in transferring heat from the fuel to the pot than the so called traditional stoves.

The bulk of South Africa's poor are concentrated in the wooded biomes, especially woodlands, in Limpopo, KwaZulu Natal, and the Eastern Cape. Over 80% of these rural households depend on fuel wood as their primary source of energy[1]. Total demand for fuel wood is estimated at 11.2 million tons per annum, which is equivalent to 40% of residential energy demand. The number of households that depend on fuel wood as their main energy source is estimated at 2.3 – 2.8 million, the majority of which are located in rural areas. This represents some 12 – 15 million people or 25 – 30% of the South African population.

According to the Statistics SA, 2007 the estimated total South Africa Population is 48.5 Million. The total number of households is estimated at 12.5 Million. South Africa is divided into Nine Provinces. Of these provinces Gauteng and Kwazulu-Natal are the most populous provinces both in terms of population and the number of households. ECOS will target all potential households in all the provinces in South Africa. Currently, most of the households in the South Africa use "three-stone" cooking stoves. It is the cheapest stove to produce, which is made off three suitable stones or bricks of the same height and mud on which a cooking pot can be balanced over a fire. These open fires are fairly inefficient at converting energy into heat for cooking. Fuel is wasted, as heat is allowed to escape into the open air. Furthermore, these open fires and primitive cook stoves emit a significant amount of smoke, which fills the home; this indoor cooking smoke has been associated with a number of diseases, the most serious of which are chronic and acute respiratory illnesses, such as bronchitis and pneumonia. ICS have been designed to

[1] http://www.probec.org/fileuploads/fl121155200960516600Synthesis_Report_on_Biomass_Energy_Consumption_and_Availability_in_SA_FINAL.pdf

provide an enclosure for the fire to reduce the loss of radiant heat, protect it against wind and increase heat transfer. The improvement in efficiency is achieved by properly adjusting the dimensions of the combustion chamber and ensuring effective air flow.

Thus, it is essential that adoption of improved cooking stoves on a much larger scale is urgently needed. The current PoA will promote the dissemination of ICS. This will in turn reduce deforestation and degradation of forests in South Africa through participation of the people in adopting fuel efficient stoves. This will also contribute to improvement in quality of lives of the people from South Africa through reduction of drudgery, time and money spent on fuel wood collection and through improvement of indoor air pollution. Globally, the project will contribute by reducing emission of GHG into the atmosphere.

Clean Air Renewable Energy (Pty) Ltd (CARE) is the coordinating/managing entity ("CME") for this SSC-PoA and will be implementing the CDM Programme Activities (CPAs) in South Africa. Under the scheme, it will coordinate the distribution of ICS by the distributor(s) (co-operative societies) to the rural households.

The CME will distribute the ICS's to the households at subsidized rates through the channel of the distribution networks created in each province vis-à-vis the distributors. The distributors give the ICS to the households through technician/entrepreneurs working on a contractual basis. The CME will impart the initial training for the distributors. The distributors will provide the further training to the technicians employed for installation of the cook stoves and further oversee the implementation of the cook stoves. Training will be given to technicians on implementation record keeping and maintenance of the ICS. These technicians will be designated for certain number of ICS and will be responsible for data recoding and data storage.

When giving out the ICS, the CME will have an agreement with the user containing not only information about the transaction, i.e. ICS model, serial number, but also the name, location/address and Identification Number of the user, the unique identification number of cook stove and the fuel that was being used earlier along with the type of stove used which is being replaced (the "Sales Agreement")

The Sales Agreement will assert the legal rights of the carbon credits generated by the ICS to the CME. Accordingly, the CME will use the CER proceeds to recover the costs incurred for providing the ICS to users, provide maintenance and to recoup associated costs for the dissemination of stoves, such as training of technicians, marketing activities and building new manufacturing units.

Based on the Sales Agreement, distributors will transfer the information of each ICS to the Installations Record, which will ensure that no ICS is counted more than once under the SSC-CPAs or the PoA. The Installations Record will further be transferred to the CME which is stored in electronic format as well as in the paper format. These records will also serve as the basis for the calculation of CERs.

The monitoring plan will be validated and verified by a Designated Operational Entity ("DOE"). ICS technicians will be educated by distributor, ensuring that the stakeholders involved in the implementation of SSC-CPA are aware and have agreed that their activity is being subscribed to the SSC-PoA.

Policy/measure or stated goal of the PoA

With the implementation of PoA, the ICS will replace the current usage of conventional cook stoves in the households of ECP. This will improve the indoor air pollution and reduce harmful GHG emission evolved into the atmosphere. The installed bio mass cooker posses the advantage efficiently transferring

the heat to the cooking medium ensuring the reduced usage of cooking fuel and GHG emission reductions.

Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity

The proposed SSC-PoA is a voluntary action by the Co-ordinating Managing Entity (CME) - CARE Clean Air Renewable Energy (Pty) Ltd.

Contribution of the proposed PoA to sustainable development

Environmental Benefits:

- ICS adopted households will be subjected to lesser level of indoor air pollution vis-à-vis CO_2, carbon monoxide and particulate matter as a result of implementation of this project activity. Pollutants released from the combustion of firewood fuel form a key factor for many respiratory diseases found in rural house holds. The ECOS will help in reducing the occurrence many respiratory diseases that happens due to burning of firewood.
- Efficiently transferring the heat to the cooking medium ensures exact usage of fuel for the cooking activity reducing GHG emissions. The depletion rate of forest reserves in provincial areas will be reduced considerably.

Socio and Economic Benefits:

- Implementation of project activity results in employment opportunities for people involved with installation, maintenance and sales of these house hold biomass based cookers.
- Program will improve the status of living of people in rural house holds since the community level implementation of units of these kinds can be carried out at considerably lower costs. There will be less dependence on firewood and expenses and time associated with firewood buying and collection.
- Business development component of the *PoA* has resulted in the enhancement of capacity development and technical know how for moderately educated people in the community through workshops, seminars and training programs.
- Adaptation of locally manufactured technology using available raw materials with optimised energy efficiencies leads to build a technical self-reliance.

A.3. CMEs and participants of PoA

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Clean Air Renewable Energy (Pty) Ltd (CARE) is the coordinating/managing entity ("CME") for this SSC-PoA will be implementing the CDM Programme Activities (CPAs) in South Africa.

A.4. Party(ies)

Name of party involved ((host) indicates a host party	Private or public entity(ies) project parties (as applicable)	Kindly indicate if the party involved wishes to be considered as a project proponent (Yes/No)
South Africa	Clean Air Renewable Energy (Pty) Ltd	No

A.5. Physical/ Geographical boundary of the PoA

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The geographical area in which SSC-CPAs included in this PoA will be implemented is defined as the Republic of South Africa which has an overall 12.5 Million households. The geographical boundary of SSC-PoA in the Republic of South Africa is also given in the below figure.

Fig: Republic of South Africa in which installations of cooker units are proposed.

A.6. Technologies/measures

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Emission reductions incurred from the implemented units will be calculated using the approved methodology of *AMS. II.G.* Energy efficiency measures in the thermal applications of non-renewable biomass, version 03; hence falling under the Type II project activity – *Energy efficiency improvement projects*.

The ICS will be sourced from locally manufacturing units in each province where available else from the nearest manufacturing unit. The ICS units will be assembled locally by trained technicians working under the distributors. The CME will impart the initial training for the distributors. The distributors will provide the further training to the technicians employed for installation of the cook stoves and further oversee the implementation of the cook stoves. The CME will oversee the manufacturing process for the quality control. The model which will be decimated to the households will comprise of one pot stove and one grate (for collection of ash). The stove provided under the PoA will be a portable stove.

Fig 1: Little wood cooking stove to be installed in House holds of South Africa

A.7. Public funding of PoA

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No public funding or ODA have or will be diverted for the implementation of the PoA

SECTION B. Demonstration of additionality and development of eligibility criteria

B.1. Demonstration of additionality for PoA

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Reduction of anthropogenic GHG emissions by implemented SSC-CPA under PoA

The existing households use traditional stove for cooking purposes which mainly uses fuel wood, collected from the adjoining areas. Substituting traditionally used conventional stoves with that of efficient biomass cookers will help reduce cooking time by effective fuel usage, enhancing the heat transfer rate to the cooking medium. This will also help to reduce the usage of wood used as a fuel by which PoA will be reducing GHG emissions. As per the approved methodology in the absence of project activity baseline scenario will be the use of conventional fossil fuels in the house holds for meeting their energy demands. Hence estimated emission reductions will be calculated based on the annual non-renewable energy savings multiplied by emission factor for fuel pattern used in the area.

The proposed PoA is a voluntary coordinated action

South Africa has no laws and policies mandating the adoption of biomass cookers by house holds. The proposed SSC-PoA is a voluntary action by the CME.

The proposed voluntary coordinated action which would not be implemented in the absence of the PoA

Based on the experience from installations at various small scale and government entities, the project participants identified the barriers involved with the installation of biomass efficient cookers in South Africa. The key challenges involved with in are: imparting training program for technicians involved in installation and maintenance, building community awareness about the energy savings from cooker, ensuring proper maintenance. This mainly involve the identification of technically sound people from the community and to train them regarding operational activities of biomass efficient cookers, its supply

through local manufacturing units and creating awareness through demonstrations. The lack of subsidies from the government for investments in similar programmes due to non-profitable nature of project increases the financial risk of investors. Hence project activity would not have been installed in the provinces in the absence of POA.

Demonstration of Additionality of Proposed PoA

The additionality for the SSC-CPA is demonstrated by Approach 1 or Approach 2 applicable for the Project activity.

Approach 1: Demonstration of Additionality of Microscale Project Activities

According to the Guidelines for demonstrating additionality of microscale project activities, ver. 3, energy efficiency project activities that aim to achieve energy savings at a scale of no more than 20 gigawatt hours per year are additional if any one of the conditions below of the below conditions is satisfied:
(a) The geographic location of the project activity is in LDCs/SIDs or special underdeveloped zones of the host country identified by the Government before 28 May 2010;
(b) The project activity is an energy efficiency activity with both conditions (i) and (ii) satisfied (see below):
(i) Each of the independent subsystems/measures in the project activity achieves an estimated annual energy savings of equal to or smaller than 600 megawatt hours; and
(ii) End users of the subsystems or measures are households/communities/SMEs
The small-scale CPAs will fulfil condition (b) as:
- estimated annual energy savings of the independent subsystems (i.e. the ICS) are equal or below 600 megawatt hours, which corresponds to 1.8 GWh thermal energy savings per year. The calculation in the table below shows that individual ICS don't exceed 1.8 GWh thermal savings per year.

NCV of Biomass	0.015	TJ/tonne
Conversion from GJ to GWh	3600	GJ/GWh
SSC Type II Limit	180	GWh
Energy per tonne	0.0042	GWh/Tonne
Biomass Saved by Each Cook Stove	2.8871	Tonnes/year
Energy Saved by each Cook stove	0.0120	GWh/year

Therefore, microscale additionality condition satisfaction compliance is demonstrated here and does not need to be repeated in the SSC-CPA.
- end users of the ICS are households/ communities/ SMEs. The PoA is for dissemination of domestic ICS only.
In order to qualify for the micro scale additionality demonstration, it will be demonstrated in the CPA-DD that the number of ICS disseminated under the CPA remains under the threshold of 20 GWh

Approach 2: Additionality demonstration as per Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activities.

The additionality of the proposed PoA is demonstrated using the criteria outlined in the attachment A to the Appendix B of the *simplified modalities and procedures for small scale CDM project activities*. The barriers which might have prevented the occurrence of the project activity without CDM revenues are as presented

- **Investment Barrier:**

The alternative to the project activity is the use of the three-stone cooking stoves. The CME have made the choice to distribute the ICSs at a price below the retail price to cover the costs for the manufacturing, transporting and assembly. From the CME‟ s perspective there are no financial or economic benefits such as subsidies other than CDM related income, hence the simple cost analysis will be used to demonstrate that the costs for disseminating the ICS will be greater than the price at which the ICS will be sold. Hence the PoA can not be implemented without CDM revenues.

- **Technological Barrier:**

There is a lack of an adequately trained local workforce capable of constructing and maintaining stoves at present. The efficient stove technology to be utilised is not new, however its use in the area is not widespread, with knowledge and skills amongst households typically limited to inefficient traditional three-stone fires[19]. There is no clear development of a market that would drive such capacity to be built due to the financial barriers stated above.

Hence it can be concluded that CDM Revenue has been identified as the only realistic and adequate source of finance to overcome the existing barriers and having the scale and consistency over time necessary to implement and expand the sales of ICS in South Africa, and at the same time maintain quality and customer adherence.

B.2. Eligibility criteria for inclusion of a CPA in the PoA

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SSC – CPA to be included under this SSC – PoA must involve the following characteristics

- It will be installed by the distributor who will have a standard contractual agreement with the CMEs.
- Uses the small scale approved methodology AMS.II.G version 03. The CME will verify that all CPA-DDs employ aforesaid version of the methodology
- Each CPA will demonstrate additionality under either Approach 1 or Approach 2 as described in section B.1 of the POA DD
- The Geographical boundary of the CPA will be South Africa
- Each cook stove covered under the CPA will have a unique serial number which will ensure that there is no double counting
- The Sales Agreement of the 1st cook stove in the CPA will be the start date of the CPA. It will be ensured that the start dates of the CPA's will be after the publication of the PoA for the GSC process
- The target group for implementation involves the domestic households
- The efficiency improvement for the CPA will not be greater than 180 GWh.
- There will be no diversion of public funding or ODA involved in the project activity

B.3. Application of methodologies

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Type: Type II – Energy Efficiency Improved Projects
Methodology: AMS II.G - Energy efficiency measures in thermal applications of non-renewable biomass
Version: Version 03

The implementation of efficient cooking stoves in provincial municipalities of South Africa meets the methodology criteria of AMS II.G version 03 as given.

This category comprises appliances involving the efficiency improvements in the thermal applications of non-renewable biomass. Examples of these technologies and measures include the introduction of high efficiency biomass fired cook stoves or ovens or dryers and/or improvement of energy efficiency of existing biomass fired cook stoves or ovens or dryers.	The CPA involved in this POA involves distribution of highly efficient designed cook stoves which reduces the fuel usage ensuring appropriate heat transfer to the cooking medium. This project activity results in the saving of considerable amount of savings in the biomass which otherwise would have been consumed by less efficient cook stoves.
Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	Non renewable source of energy has been continuously used since 1989. It has been estimated that the total annual demand for the fuel wood consumption is South Africa was 9.8 Million tons in the mid 1980's. The same has been increased to 11.2 Million tons through a recent estimate in 2006 which shows an increase of 1.4 Million tons or an increase of 14% [2]. This substantives that fuel wood has been used in South Africa since 31st December 1989. The Natural forest cover (excluding the planted forests) in South Africa has decreased from 7615000 Hectares from 1990 to 7478000 Hectares in 2010 representing a decline of 1.80% in the forest area[3]. There has also been an increase in the number of households from 9.059 Million in 1996 to 12.501 Million in 2007 [4] placing pressure on forest resources. The increase of fuel wood consumption along with the increase of the number of households coupled with the decrease of the natural forest cover clearly substantiates the fact that Non-Renewable Biomass has been used since 31st December 1989. Also a base line survey carried out by the CME indicated that there has been an increase in the distance travelled to gather the firewood conducted indicate that time needed to gather firewood and distance travelled to gather firewood is increasing. The increase of the distance for the collection of the fuel wood augments the fact that the Non Renewable Biomass is being used in the households.

SECTION C. Management system

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The CME shall develop and implement a management system that includes the following

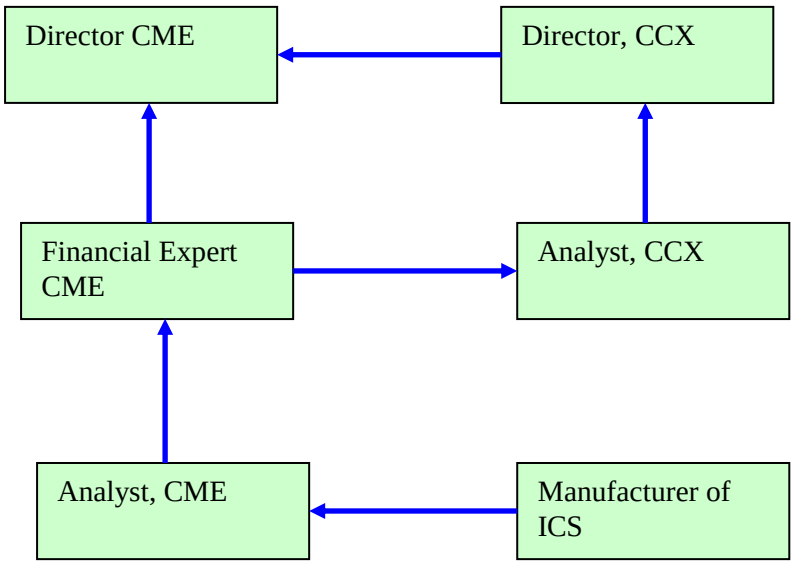
[2] http://www.probec.org/fileuploads/fl121155200960516600Synthesis_Report_on_Biomass_Energy_Consumption_and_Availability_in_SA_FINAL.pdf

[3] http://rainforests.mongabay.com/deforestation/2000/South_Africa.htm#01-cover

[4] http://www.probec.org/fileuploads/fl121155200960516600Synthesis_Report_on_Biomass_Energy_Consumption_and_Availability_in_SA_FINAL.pdf

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

The management structure involved for the review of the inclusion of the CPA in the PoA is as follows:



The roles and responsibilities of the personnel involved in the management structure are as follows:

Role	Responsibility
Analyst CME	• Obtains the inputs from the Manufacturer of ICS and the Sales Agreement. • Evaluates the additionality as per the guidelines described in section B.1 of the POA-DD.
Financial Expert, CME	• Analyzes the computation sheet provided by Analyst • Approves the additionality of the CPA • Forwards the CPA to Analyst CCX for the inclusion in the POA
Analyst CCX	• Determines the energy savings of the CPA • Analyses if the CPA falls under Guidelines for demonstrating additionality of microscale project activities, ver. 3 or if Additionality is to be demonstrated as per Attachment A to Appendix B of the simplified modalities and procedures for small scale CDM project activities.
Director, CCX	• Reviews the additionality as determined by the Analyst • Forwards the inclusion of the CPA to the Director, CME

(b) Records of arrangements for training and capacity development for personnel;

Each distributor is responsible for the installation and maintenance of ICSs. The operation of the ICS is carried out by the user, and training on how to operate and maintain the ICS is given by the distributor.

The CME will provide the initial training for the distributor; and the training will be penetrated through to the users. The training records for the distributors will be maintained in the database of the CME. Further on the recruiting of the new employee by the distributor in the team to disseminate the ICS; the distributor will inform the CME of the same and CME will impart the initial training to the new employee.

Physical maintenance of the ICS will be provided by the distributor and their technicians. The distributors will follow the monitoring plan and procedures for identifying each stove sold during the course of the project and those which are still in use, so the appropriate number of emission reductions is claimed. To facilitate this process, the distributor will assign a serial number to each ICS during its construction and record this number in the Installations Record. The serial Numbers will be present on each ICS and also on the sales agreement corresponding to the ICS. The distributors are also responsible for collecting the Sales Agreement Contract from the users
Sales Contract and Installations record

(c) A procedure to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another PoA);

Before the installation of the ICS, the user shall be informed that CDM finance is being used to fund the ICS installation, and the user shall agree, as per the Sales Contract, to:

- Cooperate with the distributor and the CME for monitoring purposes
- Transfer the rights of the CERs to the CME

The Sales Contract will also contain the following information:

- Name of customer
- Address and ID number of the customer
- Stove model and serial number
- Installation date
- Type of Fuel being used in the cook stove replaced
- Type of cook stove being replaced.

The information collected by the distributor is transferred to an electronic database (the Installations Record) which is updated regularly and shared with the CME. The Installations Record carries all the sales information listed above including the actual installation date. The installations record is a key component of the annual monitoring report, since the actual installation date is used to calculate the emission reductions achieved by the ICS installed.
Monitoring
Each SSC-CPA keeps an Installations Record, which lists all ICS installed with a unique serial number per ICS in addition to a record of the location of the stove and the kitchen. All distributors records are screened by the CME together with cross-checks on the distributors installation records in order to confirm that the installation record is authentic and that no double-counting occurs.

(d) Records and documentation control process for each CPA under the PoA;
The Sales Contract will also contain the following information:

- Name of customer
- Address and ID number of the customer
- Stove model and serial number
- Installation date
- Type of Fuel being used in the cook stove replaced
- Type of cook stove being replaced.

The information collected by the distributor is transferred to an electronic database (the Installations Record) which is updated regularly and shared with the CME. The Installations Record carries all the sales information listed above including the actual installation date. The installations record is a key

component of the annual monitoring report, since the actual installation date is used to calculate the emission reductions achieved by the ICS installed.

(e) Measures for continuous improvements of the PoA management system;

It will be ensured that the PoA management system will be reviewed annually for the continuous improvements for the management system. There will be a systematic collection and analysis of data to ensure that:

- There is relevant and sufficient documentation of management systems for the scope and scale of ICS implementation.
- The system is focused on providing quality training, assessment and support services.
  - arrangements are in place to meet regularly with distributors to seek feedback and make changes in response
  - appropriate selection processes and ongoing professional development for trainers and assessors
  - strong customer service standards
  - maintenance of and improvements to training and assessment of the distributors.
- Staff know and meet their responsibilities for applying the system, e.g.
  - communication through the organisation about management systems and decisions is effective
  - staff are actively engaged in improving the system
  - checks are made to ensure that key policies and procedures are being implemented appropriately.
- establishing key performance indicators and monitoring organisational performance against them
- gaining and analysing stakeholders' feedback about the overall performance
- internal audit and organisational self-assessment
- The CMW will also monitor their improvements to determine their effectiveness and make further changes if needed.

SECTION D. Duration of PoA

D.1. Start date of PoA

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07/09/2011 which is the date of signing of contract between the CME and the Consultants.

D.2. Length of the PoA

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The length of the PoA is considered as 28 years.

SECTION E. Environmental impacts

E.1. Level at which environmental analysis is undertaken

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The PoA involves the distribution and installation of residential and scholar efficient cooking stoves. These efficient cooking stoves do not entail significant negative environmental impacts. For this reason, it is reasonable to undertake a single environmental analysis at the level of the PoA rather than individual assessments for each SSC-CPA.

E.2. Analysis of the environmental impacts

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The implementation of PoA does not impose any severe impacts on the ecological system in the surrounding areas. The project activity included in this PoA helps in reducing the consumption of firewood by efficient fuel combustion there by reducing the pressure of deforestation, reducing indoor pollution.

SECTION F. Local stakeholder comments

F.1. Solicitation of comments from local stakeholders

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Due to the varied demographics amongst the CPA's that will be implemented the CME has decided to conduct the stakeholder meeting for each of the CPA's included in the PoA to gauge the opinions and comments of the stakeholders in the immediate project area.

F.2. Summary of comments received

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Not Applicable as the stakeholder meeting will be conducted for each CPA.

F.3. Report on consideration of comments received

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Not Applicable as the stakeholder meeting will be conducted for each CPA.

SECTION G. Approval and authorization

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Letter of approval from the party for the POA will be provided to the DOE at the time of request for registration of the given project activity.

PART II. Generic component project activity (CPA)

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

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The proposed small scale CPA ("hereafter SSC-CPA") involves the installation of energy efficient improved biomass based cooking stoves (ICS) in the households of [Name of the towns] in [Name of the province], South Africa. The total number of households which will constitute in the CPA is [Number of households]. Thus the estimated number of cook stoves that will be installed as a part of CPA will be [Number of cook stoves]. Currently, most of the households in the regions use "three-stone" cooking stoves. It is the cheapest stove to produce, which is made off three suitable stones or bricks of the same height and mud on which a cooking pot can be balanced over a fire. These open fires are fairly inefficient at converting energy into heat for cooking. Fuel is wasted, as heat is allowed to escape into the open air. Furthermore, these open fires and primitive cook stoves emit a significant amount of smoke, which fills the home; this indoor cooking smoke has been associated with a number of diseases, the most serious of which are chronic and acute respiratory illnesses, such as bronchitis and pneumonia. ICS have been designed to provide an enclosure for the fire to reduce the loss of radiant heat, protect it against wind and increase heat transfer. The improvement in efficiency is achieved by properly adjusting the dimensions of the combustion chamber and ensuring effective air flow.

The project will reduce deforestation and degradation of forests in South Africa through participation of the people in adopting fuel efficient stoves. This will also contribute to improvement in quality of lives of the people from South Africa through reduction of drudgery, time and money spent on fuel wood collection and through improvement of indoor air pollution. Globally, the project will contribute by

reducing emission of GHG into the atmosphere by reducing the fuel consumption through the efficient heat transfer.

The CME will distribute the ICE's to the households at subsidised costs through the channel of the distribution networks created in each province vis-à-vis the distributors. The distributors give the ICS to the households through technician/entrepreneurs working on a contractual basis. The CME will impart the initial training for the implementers. The distributors will provide the further training to the technicians employed for installation of the cook stoves and further oversee the implementation of the cook stoves. Training will be given to technicians on implementation record keeping and maintenance of the ICS. These technicians will be designated for certain number of ICS and will be responsible for data recoding and data storage.

The proposed SSC-CPA is a voluntary action by the Co-ordinating Managing Entity (CME) - Clean Air Renewable Energy (Pty) Ltd (CARE).

Contribution to sustainable development

Environmental Benefits:

- ICS adopted households will be subjected to lesser level of indoor air pollution vis-à-vis CO_2, carbon monoxide and particulate matter as a result of implementation of this project activity. Pollutants released from the combustion of firewood fuel form a key factor for many respiratory diseases found in rural house holds. The ECOS will help in reducing the occurrence many respiratory diseases that happens due to burning of firewood.
- Efficiently transferring the heat to the cooking medium ensures exact usage of fuel for the cooking activity reducing GHG emissions. The depletion rate of forest reserves in provincial areas will be reduced considerably.

Socio and Economic Benefits:

- Implementation of project activity results in employment opportunities for people involved with installation, maintenance and sales of these house hold biomass based cookers.
- Program will improve the status of living of people in rural house holds since the community level implementation of units of these kinds can be carried out at considerably lower costs. There will be less dependence on firewood and expenses and time associated with firewood buying and collection.
- Business development component of the *CPA* has resulted in the enhancement of capacity development and technical know how for moderately educated people in the community through workshops, seminars and training programs.
- Adaptation of locally manufactured technology using available raw materials with optimised energy efficiencies leads to build a technical self-reliance.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

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Type: Type II – Energy Efficiency Improved Projects
Methodology: AMS II.G - Energy efficiency measures in thermal applications of non-renewable biomass
Version: Version 03

B.2. Application of methodology(ies)

>>

The implementation of efficient cooking stoves in provincial municipalities of South Africa meets the methodology criteria of AMS II.G version 03 as given.

This category comprises appliances involving the efficiency improvements in the thermal applications of non-renewable biomass. Examples of these technologies and measures include the introduction of high efficiency biomass fired cook stoves or ovens or dryers and/or improvement of energy efficiency of existing biomass fired cook stoves or ovens or dryers.	The CPA involved in this POA involves distribution of highly efficient designed cook stoves which reduces the fuel usage ensuring appropriate heat transfer to the cooking medium. This project activity results in the saving of considerable amount of savings in the biomass which otherwise would have been consumed by less efficient cook stoves.
Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	Non renewable source of energy has been continuously used since 1989. It has been estimated that the total annual demand for the fuel wood consumption is South Africa was 9.8 Million tons in the mid 1980's. The same has been increased to 11.2 Million tons through a recent estimate in 2006 which shows an increase of 1.4 Million tons or an increase of 14% [5]. This substantives that fuel wood has been used in South Africa since 31st December 1989. The Natural forest cover (excluding the planted forests) in South Africa has decreased from 7615000 Hectares from 1990 to 7478000 Hectares in 2010 representing a decline of 1.80% in the forest area[6]. There has also been an increase in the number of households from 9.059 Million in 1996 to 12.501 Million in 2007 [7] placing pressure on forest resources. The increase of fuel wood consumption along with the increase of the number of households coupled with the decrease of the natural forest cover clearly substantiates the fact that Non-Renewable Biomass has been used since 31st December 1989. Also a base line survey carried out by the CME indicated that there has been an increase in the distance travelled to gather the firewood conducted indicate that time needed to gather firewood and distance travelled to gather firewood is increasing. The increase of the distance for the collection of the fuel wood augments the fact that the Non Renewable Biomass is being used in the households.

[5] http://www.probec.org/fileuploads/fl121155200960516600Synthesis_Report_on_Biomass_Energy_Consumption_and_Availability_in_SA_FINAL.pdf

[6] http://rainforests.mongabay.com/deforestation/2000/South_Africa.htm#01-cover

[7] http://www.probec.org/fileuploads/fl121155200960516600Synthesis_Report_on_Biomass_Energy_Consumption_and_Availability_in_SA_FINAL.pdf

B.3. Sources and GHGs

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Source	Gas	Included	Justification/Explanation
Baseline: Combustion of non renewable biomass for cooking.	CO_2	Yes	Major Source of emissions
	CH_4	No	Minor source of emissions and limited data available. Exclusion is conservative assumption.
	N_2O	No	Minor source of emissions and limited data available. Exclusion is conservative assumption.
Project activity: Combustion of non renewable biomass for cooking	CO_2	Yes	Major Source of emissions
	CH_4	No	Minor source of emissions and limited data available.
	N_2O	No	Minor source of emissions and limited data available.

B.4. Description of baseline scenario

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As per Paragraph 4 of the applied methodology AMS IIG Version 03, in the absence of the programme, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs.

B.5. Demonstration of eligibility for a generic CPA

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The CPA meets the criteria as specified in the PoA as follows:

- The cook stoves in the CPA will be installed by distributor who will have a standard contractual agreement with the CMEs.
- The CPA Uses the small scale approved methodology AMS.II.G version 03.
- Each CPA will demonstrate additionality under either Approach 1 or Approach 2 as described in section B.1 of the POA DD
- The Geographical boundary of the CPA is South Africa
- Each cook stove covered under the CPA will have a unique serial number which will ensure that there is no double counting
- The Sales Agreement of the 1st cook stove in the CPA will be the start date of the CPA. The start dates of the CPA will be after the publication of the PoA for the GSC process
- The target group for implementation involves the domestic households
- The efficiency improvement for the CPA is xxx GWh.
- There will be no diversion of public funding or ODA involved in the project activity

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

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The key components in the methodology AMS II.G for calculating net emissions reductions involve differentiation between non renewable biomass and demonstrable renewable biomass and the occurrence of leakage.

Emission reduction calculation

According to paragraph 5 of methodology AMS II.G version 03, emission reductions would be calculated as:

$$ER_y = B_{y,savings} \times f_{NRB} \times NCV_{biomass} \times EF_{projected\_fossilfuel}$$

Where:

ER_y : Emission reductions during the year y in tCO_2e

$B_{y,savings}$: Quantity of woody biomass that is saved in tonnes

f_{NRB} : Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass

$NCV_{biomass}$: Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)

$EF_{projected\_fossilfuel}$: Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO_2/TJ

From paragraph 6 $B_{y,savings}$ can be estimated from

Option 2

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

Where:

B_{old} : Quantity of woody biomass used in the absence of the project activity in tonnes

η_{old} :

1. Efficiency of the system being replaced, measured using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of system is being replaced;
2. A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney; for other types of systems a default value of 0.2 may be optionally used

As the programme involves replacement of cook stoves without a grate or a chimney the default value of 0.10 is being used.

η_{new} : Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol. Use weighted average values if more than one type of system is being introduced by the project activity.

As detailed in paragraph 7 of AMS II.G version 03, B_{old} can be determined using one of the following options:

(a) Calculated as the product of the number of systems multiplied by the estimated average annual consumption of woody biomass per appliance (tonnes/year). This can be derived from historical data or a survey of local usage.

(b) Calculated from the thermal energy generated in the project activity as

$$B_{old} = \frac{HG_{p,y}}{NCV_{biomass} * \eta_{old}}$$

Where:

$HG_{p,y}$: Amount of thermal energy generated by the project technology in year (TJ)

The methodology requires choosing one of the two options mentioned above for calculating the "Quantity of woody biomass used in the absence of the project activity (B_{old})".

Option a) has been selected to determine B_{old} based on number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance substituted (tonnes/year).

The average consumption of woody biomass per cook stove is considered as 4.5 tons per annum per household as estimated in "Synthesis Report: Biomass Energy Consumption and availability in South Africa"[8]

As per paragraph 8 of the approved methodology AMS IIG Version 03, "the Project Participants shall determine the shares of renewable and non-renewable woody biomass in B_{old} (the quantity of woody biomass used in the absence of the project activity) the total biomass consumption using nationally approved methods (e.g. surveys or government data if available) and then determine $f_{NRB,y}$

$f_{NRB,y}$ is determined through the following steps:

Step 1: Identification of Woody Biomass Production Area

As per AMS IIG Version 3 the Demonstrable Renewable Woody Biomass is defined as:
Woody biomass is "renewable" if one of the following two conditions is satisfied:

1. The woody biomass is originating from land areas that are forests
   (a) The land area remains a forest; and
   (b) Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting); and
   (c) Any national or regional forestry and nature conservation regulations are complied with.

According to "Forest Resource Assessment Country Report for South Africa, 2010, Forest Area under sustainable management practices, A = 1110000 ha[9]

Step 2: Estimation of Demonstrably Renewable Biomass (DRB)

Mean annual increment of wood, B =1.8 tonne/ha/year[10]

Therefore the total standing biomass DBR accessible as sustainable fuel wood DRB = A*B= 1998000 tonnes per year

Step 3: The Annual Harvest of Wood in South Africa

8 http://www.probec.org/fileuploads/fl121155200960516600Synthesis_Report_on_Biomass_Energy_Consumption_and_Availability_in_SA_FINAL.pdf

9 http://rainforests.mongabay.com/deforestation/2000/Rwanda.htm

10 http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf

Total round wood intake by Industries in South Africa, C = 19,638,000m^3/ year[11]
Density of fuel wood (D) = 0.58 tonne/ m3[12]

Industrial consumption in South Africa, E= C*D = 11,390,040 tonnes/year
Total fuel wood consumption in household, F = 11,200,00[13] tonnes/year/

Total annual harvest of wood in South Africa, H= E+F = 22590040 tonnes/year

Step 4: Calculation of Non-renewable woody biomass (NRB)

Non-renewable woody biomass (NRB) is the quantity of woody biomass used in the absence of the project activity (H) minus the DRB component, so long as at least two of the following supporting indicators are shown to exist:

- Trend showing increase in time spent or distance travelled by users (or fuel-wood suppliers) for gathering fuel wood or alternatively trend showing increase in transportation distances for the fuel wood transported into the project area
- Survey results, national or local statistics, studies, maps or other sources of information such as remote sensing data that show that carbon stocks are depleting in the project area
- Increasing trends in fuel wood price indicating scarcity
- Trends in the type of cooking fuel collected by users, suggesting scarcity of woody biomass.

As per the report "Changes in fuel wood use and selection following electrification in the Bushbuckridge lowveld, South Africa"[14] it is mentioned that "The proportion of households purchasing fuel wood had increased, probably in response to a number of factors, including (i) increased fuel wood scarcity in the local environment as reflected by increased fuel wood collection times, changes in fuel wood species preferences, and ranking of scarcity by local collectors, and (ii) increases in the price of fuel wood well below that of other fuels and the prevailing inflation rate."

As per the report "Fuel wood and poverty alleviation in South Africa: opportunities, constraints and intervention options" Page No. 03 details that "Nationally, there has been a general decline in woody biomass as a consequence of increasing human population and land transformation to arable and residential purposes, with 10 % of the savanna biome fully transformed and 11 % partially transformed (Thompson *et al*. 2001)."[15]

As per the report "Household Energy Consumption: Community Context and Fuel wood Transition" it has been deliberated in page No. 6 that there is a trend in the change of type of cooking fuels collected by users "Other factors associated with reduced consumption of fuel wood and instead use of alternative fuels are forest scarcity and increased fuel wood collection time (Heltberg et al. 2000) and household size (Alam et al. 1998; Ouedraogo 2006)"[16].

[11] http://forestry.daff.gov.za/webapp/Documents/FSA-Abstracts2009.pdf
[12] Section 7.3, Global Forest Resources Assessment 2010, South Africa
[13] http://www.probec.org/fileuploads/fl12115520096051660 0Synthesis_Report_on_Biomass_Energy_Consumption_and_Availability_in_SA_FINAL.pdf
[14] *eprints.ru.ac.za/486/1/fuelwood.pdf*

[15] *www2.dwaf.gov.za/webapp/resourcecentre/.../**Fuelwood**_Report.pdf*
[16] *www.psc.isr.umich.edu/pubs/pdf/rr07-629.pdf*

Hence it is justified that there has been a reduction in the carbon stocks due to the forest sacristy, a change in the trend in the type of cooking fuel collected suggesting scarcity of woody biomass and also increase in the fuel wood collection time.

As it has been shown that more than two of the indicators as mentioned in the methodology AMS IIG, Version 03 exist, the Non-renewable woody biomass (NRB) can be calculated as the quantity of woody biomass used in the absence of the project activity (H) minus the DRB component

Non-renewable woody biomass, NRB = H-DRB = 20592040 tonnes/year

Step 5: The fraction of woody biomass saved by the project activity in year *y* that can be established as non-renewable $f_{NRB,y}$

As per paragraph 11 of the methodology AMS IIG Version 03, $f_{NRB,y}$= NRB/(NRB+DRB) = 20592040/(20592040+1998000)=0.911

Leakage

As per the paragraph 13 of the methodology AMS II.G Version 03,

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 following potential source of leakage shall be considered:

(a) The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass used by the non-project households/users that is attributable to the project activity then Bold is adjusted to account for the quantified leakage. Alternatively, B_{old} is multiplied by a net gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

The default value of 0.95 has been used as the net gross adjustment factor to account for the leakages in the program.

As per the paragraph 14 of the methodology AMS II.G Version 03 "If equipment currently being utilized is transferred from outside the boundary to the project activity, leakage is to be considered."

The project does not involve any transfer of equipments from outside the project boundary to the project boundary. Thus the above provision on leakage is not applicable.

B.6.2. Data and parameters that are to be reported ex-ante

(Copy this table for each data and parameter.)

Data / Parameter	$Quantity_{Apllicane}$
Unit	tonnes/appliance/year
Description	Average annual consumption of woody biomass per appliance substituted
Source of data	Estimated using Historical data and Local Survey
Value(s) applied	4.5
Choice of data or Measurement methods and procedures	As estimated in "Synthesis Report: Biomass Energy Consumption and availability in South Africa". The estimate is based on historical data and surveys of local usage as referenced above, as required by the methodology.
Purpose of data	To calculate B_{old}
Additional comment	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	η_{old}
Unit	Percentage
Description	Efficiency of the system being replaced (Traditional Cooking Stoves)
Source of data	Paragraph 5 of AMS II.G, Version03
Value(s) applied	10%
Choice of data or Measurement methods and procedures	The default value of 0.10 is used as the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney.
Purpose of data	To calculate $B_{y,savings}$
Additional comment	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	f_{NRB}
Unit	Percentage
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
Source of data	Calculated as described in Section E.6.1
Value(s) applied	0.911
Choice of data or Measurement methods and procedures	Data available from public domain has been used to calculate f_{NRB}
Purpose of data	To calculate Emission Reductions
Additional comment	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	$NCV_{biomass}$
Unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted
Source of data	Paragraph 5 of AMS II.G/v03
Value(s) applied	0.015
Choice of data or Measurement methods and procedures	As per the methodology AMS II.G/v03
Purpose of data	To calculate Emission Reductions
Additional comment	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	$EF_{projected\_fossilfuel}$
Unit	tCO_2/TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers
Source of data	AMS IIG Version 03
Value(s) applied	81.6
Choice of data or Measurement methods and procedures	Default value as per methodology has been applied
Purpose of data	To calculate Emission Reductions
Additional comment	This parameter shall remain fixed for the monitoring periods.

Data / Parameter	**AF**
Unit	tCO_2/TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers
Source of data	AMS IIG Version 03
Value(s) applied	81.6
Choice of data or Measurement methods and procedures	Default value as per methodology has been applied
Purpose of data	To calculate Emission Reductions
Additional comment	This parameter shall remain fixed for the monitoring periods.

B.6.3. Ex-ante calculations of emission reductions

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According to paragraph 5 of methodology AMS II.G/v03, emission reductions shall be calculated as

$$ER_y = B_{y,savings} \times f_{NRB} \times NCV_{biomass} \times EF_{projected\_fossilfuel}$$

Where value of parameters used for estimation of emission reductions are presented in the table 6.2 below.

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

As detailed in paragraph 7 of AMS II.G version 03, B_{old} can be determined as:

(a) Calculated as the product of the number of systems multiplied by the estimated average annual consumption of woody biomass per appliance (tonnes/year). This can be derived from historical data or a survey of local usage.

The average consumption of woody biomass per cook stove is considered as 4.5 tons per annum per household as estimated in "Synthesis Report: Biomass Energy Consumption and availability in South Africa"[17]

In order to account for leakage, B_{old} is multiplied by a net to gross adjustment factor of 0.95, in which case surveys are not required. The project does not involve any transfer of equipments from outside the project boundary to the project boundary. Thus this provision on leakage is not applicable.

Parameter	Notation	Value	Units	Reference
Number of improved cooking stove installed in CPA	N	[Number of cook stoves]	Number	Data base about the installations
Annual average biomass consumption per appliance	$Quantity_{Appliance}$	4.5	Tonnes	As estimated in "Synthesis Report: Biomass Energy Consumption and availability in South Africa"[18]
Efficiency of the system replaced	η_{old}	10.00%	Percentage	Default Value As specified in the approved methodology AMS II.G, Version 03:
Efficiency of the system deployed as a part of project activity	η_{new}	27.90	Percentage	Measured value on the basis of representative sampling.
Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass	f_{NRB}	0.911	Percentage	Calculated as described in E.6.1 of the PoA

17 http://www.probec.org/fileuploads/fl121155200960516600Synthesis_Report_on_Biomass_Energy_Consumption_and_Availability_in_SA_FINAL.pdf

18 http://www.probec.org/fileuploads/fl121155200960516600Synthesis_Report_on_Biomass_Energy_Consumption_and_Availability_in_SA_FINAL.pdf

Net Calorific value of the non-renewable woody biomass which is substituted	$NCV_{biomass}$	0.015	TJ/tonne	As specified in the approved methodology AMS II.G, Version 03 IPCC default for wood fuel, 0.015 TJ/tonne
Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO_2/TJ	$EF_{projected\_fossilfuel}$	81.6	tCO_2/TJ	As specified in the approved methodology AMS II.G Version 03. Use a value of 81.6 tCO2/TJ
Gross Adjustment Factor	AF	0.95		As per methodology AMS II.G, version 03.
Leakage emissions	L_y	0	tCO_2	

B_{old} = AF * N * $Quantity_{Applicance}$ = 0.95*[Number of Cook stoves]*4.5 = [Amount in Tonnes] tonnes

$B_{y,savings}$ = $B_{y,savings} = B_{old} \cdot \left(1 - \frac{\eta_{old}}{\eta_{new}}\right)$ = [Amount in Tonnes] * (1-0.1/0.279) = [Savings of fuel wood in Tonnes] tonnes

ER_y = [Savings of fuel wood in Tonnes] * 0.911 * 0.0150 * 81.6 = [Emission Reductions] tCO2e

B.7. Application of the monitoring methodology and description of the monitoring plan

B.7.1. Data and parameters to be monitored by each generic CPA

(Copy this table for each data and parameter)

Data / Parameter	**N**
Unit	Number
Description	Number of ICS installed
Source of data	Records of the installation as per the Sales agreement
Value(s) applied	Varies according to CPA
Measurement methods and procedures	The Sales agreement will be stored in paper format as well as the same will be transferred to electronic database which will be maintained by the CME
Monitoring frequency	Once every year
QA/QC procedures	The database is periodically checked by the CME for consistency and accuracy. Each stove will have unique serial Number which will ensure there is no double counting
Purpose of data	To calculate Emission Reductions
Additional comments	

Data / Parameter	η_{new}
Unit	Fraction
Description	Efficiency of stove being deployed as part of the project activity
Source of data	Annual Water-Boiling test on a representative sample
Value(s) applied	0.279
Measurement methods and procedures	Water boiling test will be carried annually on representative samples of improved stoves in use, by third party. After one year, a one-year-old stove will be tested; whereas after two-years, a one-year and two-year-old stove will be tested.
Monitoring frequency	Once every year
QA/QC procedures	The CME will supervise WBT with expert independent assistance/ third parties. Water Boiling Test will be carried out for a random sample of deployed efficient stoves. Each SSC-CPA will test stove efficiency among a statistically significant sample of end users using a water-boiling test. The sample size shall be chosen for a 90/10 precision (90% confidence interval and 10% margin of error). In cases where the result indicates that 90/10 precision is not achieved, the lower bound of 90% confidence interval of the parameter value will be chosen as an alternative to repeating the survey efforts to achieve the 90/10 precision.
Purpose of data	To Calculate Emission Reductions
Additional comments	

Data / Parameter	Usage rate
Unit	Fraction
Description	To determine only stoves that are still operating, measured ex-post through survey/ user feedback
Source of data	Survey
Value(s) applied	1
Measurement methods and procedures	Surveys will be conducted on a representative sample of end-users taken from the CPA sales database
Monitoring frequency	Once every year
QA/QC procedures	Surveys will be conducted by distributors and the results will be checked by the CME.
Purpose of data	To Calculate Emission Reductions
Additional comments	

B.7.2. Description of the monitoring plan for a generic CPA

>>

As per approved methodology AMS IIG, Version 03:

1. Monitoring shall consist of checking the efficiency of all appliances or a representative sample thereof, at least once every two years (biennial) to ensure that they are still operating at the specified efficiency (η_{new}) or replaced by an equivalent in-service appliance. Where replacements are made, monitoring shall also ensure that the efficiency of the new appliances is similar to the appliances being replaced.

2. Monitoring shall ensure that:
   - Either the replaced low efficiency appliances are disposed of and not used within the boundary or within the region; or
   - If baseline stoves continue to be used, monitoring shall ensure that the fuel-wood consumption of those stoves is excluded from B_{old}.

Due to the large number of ICS that will be installed the annual check of efficiency will be done through representative sampling methods. In order to check the operating efficiency, the Water Boiler Test (WBT) will be performed on a randomly chosen representative sample of one year old operating stoves after the first year, and each year after that, for the entire duration of each CPA.

Similarly the number of cook stoves installed as the part of the Program that are still operating will also be cheeked through the representative sampling methods.

The old stoves would be disposed of during installation of ICS and records shall be maintained. Alternatively, the efficiency tests on a sample of ICS will also investigate the extent to which traditional stoves are destroyed and no longer used, even in a secondary role, in the houses adopting the ICS,

As per approved methodology AMS IIG, Version 03 the following guidance is being used for the representative sampling method:
A statistically valid sample of the locations where the systems are deployed, with consideration, in the sampling design, of occupancy and demographics differences can be used to determine parameter values used to determine emission reductions, as per the relevant requirements for sampling in the .General guidelines for sampling and surveys for small-scale CDM project activities. On the other hand when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters. In cases where survey results indicate that 90/10 precision is not achieved, the lower bound of a 90% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10.

Sample size will be chosen for a 90/10 precision (90% confidence interval and 10% margin of error); in cases where survey results indicate that 90/10 precision is not achieved, the lower bound of a 90% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve a 90/10 precision.

In accordance with "**Standard for Sampling and Surveys for CDM project activities and programme of activities"**
The sampling plan will contain the following information:
(a) sampling design;
(b) data to be collected; and
(c) implementation plan.

(a) Sampling Design:

(i) Objectives and Reliability Requirements:

The objective of the sampling effort is to determine check the operating efficiency, the Water Boiler Test (WBT) and also to determine if the installed cook stoves are operating.

As per approved methodology AMS IIG, Version 03 the following guidance is being used for the representative sampling method:

A statistically valid sample of the locations where the systems are deployed, with consideration, in the sampling design, of occupancy and demographics differences can be used to determine parameter values used to determine emission reductions, as per the relevant requirements for sampling in the .General guidelines for sampling and surveys for small-scale CDM project activities. On the other hand when the project proponent chooses to inspect annually, a 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters. In cases where survey results indicate that 90/10 precision is not achieved, the lower bound of a 90% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10.

(ii) Target Population:

The target population represents the rural households in the Eastern Cape.

(iii) Sampling Method:

The selected sampling method is simple random sampling

(iv) Sample Size:

Sample size will be chosen for a 90/10 precision (90% confidence interval and 10% margin of error); in cases where survey results indicate that 90/10 precision is not achieved, the lower bound of a 90% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve a 90/10 precision.

The sample size is calculated using the following Steps:

Ste 1: Margin of Error (ME): ME = critical value * standard error. As per the approved methodology AMS IIG Version 3, margin of Error is assumed as 10%.

Step 2: The critical value is a factor used to compute the margin of error. Because the sampling distribution is approximately normal and the sample size is large, we can express the critical value as a z score by following these steps.

- Step 1 : $\alpha = 1 - (\text{confidence level} / 100) = 1 - (90/100) = 0.1$ (90% confidence interval as per the approved methodology AMS IIG Version 3)
- Step 2: critical probability (p*): $p^* = 1 - \alpha/2 = 1 - 0.1/2 = 0.95$

The critical value is the z score having a cumulative probability equal to 0.95. From the Normal Distribution Calculator, we find that the critical value is 1.64.

Step 3: Calculation of Standard Error (SE):

SE=sqrt(p(1-p)/n)
If the sample is skewed highly one way or the other, the population probably is, too. However, we don't know the skewed percentage. Thus as a default value 50% is considered, which gives the largest sample size.
P=50%

SE=0.5*SQRT(1/n)
ME=1.64*0.5*SQRT(1/n)
=0.82*SQRT(1/n)

The value of he sample size is also cross checked with the website: http://www.raosoft.com/samplesize.html

(v) Sampling Frame:

The sampling frame consists of all the households which will have the Energy Efficient Cook stoves (ICS) installed.

(b) Data:

(i) Field Measurements:

The variables include the operating efficiency by the use of the Water Boiler Test (WBT) which will be performed on a randomly chosen representative sample of one year old operating stoves after the first year, and each year after that, for the entire duration of each CPA.

Similarly the number of cook stoves installed as the part of the Program that are still operating will also be checked through the representative sampling methods once every year.

(ii) Quality Assurance/Quality Control:

At the time of cook stoves installation a user agreement will be executed which details the stoves that will be installed and assigns a stove serial number to each of the stove installed in its records. In addition the location of the stove, the type of fuel being replaced and the type of cook stove replaced will also be recorded. These records are primarily collected by the distributor and further transferred to the CME who archives the records both electronically and in paper format. The records are also screened by the CME together with cross-checks on the distributor records in order to confirm that the installation record is authentic and that no double-counting occurs. The CME enumerates the number of cook stoves present in the records to determine the total number of cook stoves covered under the CPA.

The CME will impart the initial training for the distributors. The distributors will provide the further training to the technicians employed for installation of the cook stoves and further oversee the implementation of the cook stoves. Training will be given to technicians on implementation record keeping and maintenance of the ICS. These technicians will be designated for certain number of ICS and will be responsible for data recoding and data storage.

(iii) Analysis:

The operating efficiency by the use of the Water Boiler Test (WBT) is ex-post value used for η_{new} which is further used in calculation of $B_{y,savings}$

(c) Implementation:

(i) Implementation Plan:

Define the schedule for implementing the sampling effort and identify the skills and resources required for data collection and the analyses.

The overall monitoring and the implementation of the sampling plan will be co-ordinated by the CME and the management staff. They will ensure successful monitoring of the emission reductions of the proposed project during its crediting period. Furthermore, the survey of the representative sample for the parameters will be carried out by the Distributor in conjecture with the CME. The CME will employ third party agencies to undertake the efficiency tests for the representative samples of cook stoves installed.

At the time of cook stoves installation a user agreement will be executed which details the stoves that will be installed and assigns a stove serial number to each of the stove installed in its records. In addition the location of the stove, the type of fuel being replaced and the type of cook stove replaced will also be recorded. These records are primarily collected by the distributor and further transferred to the CME who archives the records both electronically and in paper format. The records are also screened by the CME together with cross-checks on the distributor records in order to confirm that the installation record is authentic and that no double-counting occurs. The CME enumerates the number of cook stoves present in the records to determine the total number of cook stoves covered under the CPA.

The CME will impart the initial training for the distributors. The distributors will provide the further training to the technicians employed for installation of the cook stoves and further oversee the implementation of the cook stoves. Training will be given to technicians on implementation record keeping and maintenance of the ICS. These technicians will be designated for certain number of ICS and will be responsible for data recoding and data storage.

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Appendix 1: Contact information on entity/individual responsible for the PoA

Organization	Clean Air Renewable Energy (Pty) Limited
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Appendix 2: Affirmation regarding public funding

No public funding or ODA will be diverted for the implementation of the PoA

Appendix 3: Application of methodology(ies)

Type: Type II – Energy Efficiency Improved Projects
Methodology: AMS II.G - Energy efficiency measures in thermal applications of non-renewable biomass
Version: Version 03

Appendix 4: Further background information on ex ante calculation of emission reductions

Please refer section B.6.1

Appendix 5: Further background information on the monitoring plan

Please refer Section B.7.2

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History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the programme design document form for small-scale CDM programmes of activities" (EB 66, Annex 13).
01	EB33, Annex43 27 July 2007	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		