MICROENERGY CREDITS – MICROFINANCE FOR CLEAN ENERGY PRODUCT LINES – AFRICA – SOLAR LAMPS AND EFFICIENT COOKSTOVES – 10341 – CPA -0003

Document Prepared by MicroEnergy Credits Corporation

Project Title	*MicroEnergy Credits – Microfinance for Clean Energy Product Lines – Africa – Solar Lamps & Efficient cook stoves – 10341 –CPA - 0003*
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1 PROJECT DETAILS

1.1 Summary Description of the Project

A summary description of the technologies/measures to be implemented by the project

In the rural areas in Kenya, the predominant means of cooking are traditional cook stoves that use charcoal or wood as fuel. The smoke and fumes from these inefficient stoves contribute heavily to indoor air pollution, and affects human health. In rural areas of Kenya there is either no grid connection or frequent power outages and low voltage so rural households must use kerosene for indoor lighting, which also contributes to indoor air pollution.

The project activity involves marketing, distributing, and financing approximately 650,000 solar lighting systems (SLS) and 75,000 improved cook stoves (ICS), for low-income households, community organisations and small/medium enterprises across Kenya. These products provide clean, renewable energy for cooking and lighting.

Under the project activity, MicroEnergy Credits Corporation (MEC) works with project partners to develop a successful and diversified clean energy-lending program. The clean energy program addresses typical barriers for low-income clients including education, price, finance, and supply and aftersales service. MicroEnergy Credits Corp trains project partners to implement the clean energy lending program, as well as a robust and transparent carbon credit monitoring and tracking system to quantify and record the volume of carbon emission reductions created through the clean energy program. The carbon finance is used to expand and sustain the clean energy program through:

- Client education and marketing
- Internal training and capacity building
- Onlending funds to local SMEs producing the clean energy products
- Aftersales service and maintenance
- Lowering the interest or principal cost to the client

The location of the project

The products sold will be restricted to the boundary of the Republic of Kenya. The activity will involve households across the host country. The location of each clean energy installation as per the household address or the address of the nearest bank branch that has distributed product of provided loan will be recorded in MicroEnergy Credit's Credit Tracker Platform.

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

The products provide clean energy for cooking and renewable energy for lighting. The cookstoves distributed under the project activity replace traditional cookstoves thereby reducing the amount of fuelwood used for cooking in the baseline by households and thus reducing GHG emissions corresponding to the fuelwood saving by the project activity. The solar lighting systems replace kerosene-based lamps in households, which would have resulted in GHG emissions due to burning of fossil fuel i.e. kerosene.

A brief description of the scenario existing prior to the implementation of the project

For solar lighting systems, in the baseline scenario, the households receiving these solar lighting systems are either not connected to the grid or have intermittent electricity supply from the grid resulting in use of kerosene for lighting in the baseline scenario.

For cook stoves, the households receiving these efficient cook stoves, are using inefficient cooking devices in the baseline, thus resulting into higher wood or charcoal consumption in the baseline. The targeted end user group for this project includes, individual households, community organisations and small/medium enterprises in Kenya.

An estimate of annual average and total GHG emission reductions and removals

The activity will reduce annual average emissions of 90,914 tCO_2 and total emission reductions is 636,399 tCO_2.

Yearly distribution of these products would follow the schedule as per the operation numbers provided in the tables below.

Year	Improved Cookstoves
1	5,000
2	10,000
3	15,000
4	75,000
5	75,000
6	75,000
7	75,000

Year	Solar Lighting systems
1	650,000
2	650,000
3	650,000
4	650,000
5	650,000
6	650,000
7	650,000

1.2 Sectoral Scope and Project Type

The project includes the following sectoral scopes and project type –

- Improved cookstoves – 3 (Energy demand); Type II - Energy efficiency improvement project.
- Solar lighting devices – 1 (Energy industries (renewable - / non-renewable sources); Type III - Other projects reducing annually up to 60 ktCO_2e.

The project is not a grouped project

1.3 Project Eligibility

The project falls within the scope of the VCS Program. Also, the project does not fall under the category of excluded projects mentioned in the VCS Standard v4.2 and is therefore eligible under the scope of the VCS Program.

Table 1: VCS Program scope

Scope	Applicability
The six Kyoto Protocol greenhouse gases.	The project reduces GHG emissions associated with the combustion of cooking fuels and/or lighting. Gases included are CO_2, CH_4, N_2O.
Ozone-depleting substances	The project does not involve ODS
Project activities supported by a methodology approved under the VCS Program through the methodology approval process.	The project uses VCS approved CDM methodologies for both SLS and ICS component.
Project activities supported by a methodology approved under a VCS approved GHG program, unless explicitly excluded under the terms of Verra approval.	The SLS component of the project uses the methodology "AMS-III.AR.: Substituting fossil fuel based lighting with LED/CFL lighting systems --- Version 5.0" and AMS-II.G: "Energy efficiency measures in thermal applications of non-renewable biomass" (Version 8)", that are approved methodologies under the CDM, an approved GHG program under VCS
Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements.	The project activity is not a REDD+ project

Table 2: Excluded project activities under the VCS Program

Excluded Activity	Applicability
Activities that reduce hydrofluorocarbon-23 (HFC-23) emissions	N/A. The project reduces GHG emissions associated with the combustion of cooking fuels and/or lighting
Grid-connected electricity generation using hydro-power plants/units	N/A

	The project activities are energy efficiency measures and do not generate electricity from hydro-power plants/units.
Grid-connected electricity generation using wind, geothermal, or solar power plants/units	N/A. The project activities are energy efficiency/clean lighting measures and do not generate electricity from wind, geothermal, or solar power plants/units.
Utilization of recovered waste heat for, inter alia combined cycle electricity generation and the provision of heat for residential, commercial or industrial use	N/A. The project activities are energy efficiency/clean lighting measures and do not utilize recovered waste heat for any purposes.
Generation of electricity and/or thermal energy using biomass. This does not include efficiency improvements in thermal applications (e.g., cookstoves)	N/A. The project activities are energy efficiency/clean lighting measures and do not generate electricity using biomass. The project includes energy efficiency improvements in thermal applications, i.e. cookstoves.
Generation of electricity and/or thermal energy using fossil fuels, including activities that involve switching from a higher carbon content fuel to a lower carbon content fuel	N/A. The project activities do not include the generation of electricity and/or thermal energy using fossil fuels, including activities that involve switching from a higher carbon content fuel to a lower carbon content fuel.
Replacement of electric lighting with more energy efficient electric lighting such as the replacement of incandescent electrical bulbs with CFLs or LEDs	N/A. The project activities do not include the replacement of electric lighting.
Installation and/or replacement of electricity transmission lines and/or energy efficient transformers	N/A. The project activities do not include the installation and/or replacement of electricity transmission lines and/or energy efficient transformers.

Further, as per VCS Standard v4.2 following eligibility conditions need to be fulfilled for transition of registered CDM project to VCS.

Eligibility condition	Applicability
The approved GHG program validation (or verification, where the approved GHG program does not have a validation step) or VCS validation shall be completed within the relevant validation deadline as set out in Section 3.7 of the Standard v4.2 (Non-AFOLU projects shall complete validation within two years of the project start date). Validation (or verification) is deemed to have been completed when the validation (or verification) report that is submitted to the relevant program to request registration has been issued.	The inclusion report for this CPA included under the registered PoA was submitted on 05/11/2020 and the project start date is 11/11/2019.
Projects registered under another GHG program, with activities that are included within the scope of the VCS Program (see Section 2.1), shall only be eligible to complete a gap validation and/or transfer to the VCS Program where the following applies: a) For a project that does not include afforestation and/or reforestation activities: i) The project shall have an original project crediting period start date on or after 1 January 2016 with another GHG program; or ii) Where the project has an original project crediting period start date from 1 January 2013 to 31 December 2015, the project shall have issued credits during the period 1 January 2016 to 5 March 2021, or shall have a status of “issuance requested” on the relevant GHG program registry by 5 March 2021. b) For a CDM Component Project Activity (CPA) that does not include afforestation and/or reforestation activities:	The project is registered as CPA under a PoA registered with CDM GHG program. The project is being transitioned from CDM to VCS and is included within the scope of the program as per table 1 of this document. The project is a CPA which is part of a Program of Activities (PoA) with an original program crediting period start date after 1 January 2016 i.e. 21/02/2017.

i) The CPA shall be part of a Program of Activities (PoA) with an original program crediting period start date on or after 1 January 2016; or ii) Where the CPA is part of a Program of Activities (PoA) with an original program crediting period start date from 1 January 2013 to 31 December 2015 and where the CPA has an original crediting period start date from 1 January 2013 to 31 December 2015, the CPA shall have issued credits during the period 1 January 2016 to 5 March 2021, or shall have a status of "issuance requested" by 5 March 2021; or iii) Where the CPA is part of a PoA with an original program crediting period start date from 1 January 2013 to 31 December 2015 and where the CPA has an original crediting period start date on or after 1 January 2016, no prior credit issuance is required. c) For a project with afforestation and/or reforestation activities, the project shall have been registered under another GHG program on or after 1 January 2013. d) For a CDM CPA with afforestation and/or reforestation activities, the CPA shall be part of a PoA that was registered on or after 1 January 2013.	
Further, the following applies with respect to vintages: a) For a project that does not include afforestation and/or reforestation activities, only emission reductions with vintages beginning on or after 1 January 2016 are eligible for VCU issuance.	The project does not include afforestation and/or reforestation activities and shall claim emission reductions with vintages after 1 January 2016 only as the start date is 11 November 2019.

b) For a project with afforestation and/or reforestation activities, only emission reductions with vintages beginning on or after 1 January 2013 are eligible for VCU issuance	

1.4 Project Design

The project is designed as single installation of an activity.

Eligibility Criteria

N/A as this is not a grouped project.

1.5 Project Proponent

Organization name	MicroEnergy Credits Corporation
Contact person	Sriskandh Subramanian
Title	Technical Director
Address	1201 Alaskan Way Ste 200 WA 98109 Seattle United States of America sriskandh@microenergycredits.com
Telephone	+91-9999997592
Email	sriskandh@microenergycredits.com

1.6 Other Entities Involved in the Project

Organization name	N/A
Role in the project	N/A
Contact person	N/A
Title	N/A
Address	N/A

Telephone	N/A
Email	N/A

1.7 Ownership

The project ownership is with MEC. During the distribution of the ICS/SLS, the participating household will sign an End User Agreement to confirm that the ownership rights of the carbon assets generated from this project lie with MEC.

1.8 Project Start Date

11-November-2019 i.e. date of sale of first clean energy product under the proposed project activity.

1.9 Project Crediting Period

Crediting Period: Renewable, 7 years

Total number of years: 21 years

Start and End Date: 11 Nov 2019 – 10 Nov 2026

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	YES
Large project	

Year	Estimated GHG emission reductions or removals (tCO2e)
2019	63,100
2020	66,400
2021	69,700
2022	*1,09,300*

2023	*1,09,300*
2024	*1,09,300*
2025	*1,09,300*
Total estimated ERs	6,36,399
Total number of crediting years	7
Average annual ERs	90,914

1.11 Description of the Project Activity

The technologies that will be employed by this project activity would include low cost clean energy products that meet the basic needs of Kenya's low income demographic. In general, these technologies are deployed in homes and small businesses. All of the technologies employed by the project activity provide development benefits as well as environmental benefits.

- Improved cookstoves

There will be various different models of improved cookstoves that would be disseminated under this project activity. At the time of completion of the project activity there are two models that are being distributed. In future PP plans to distribute various other models of cookstoves during the course of implementation of the project activity. The complete list would be provided during verification. Technical specification of the two models currently being distributed are provided below:

- The Zoom Jet cook stove

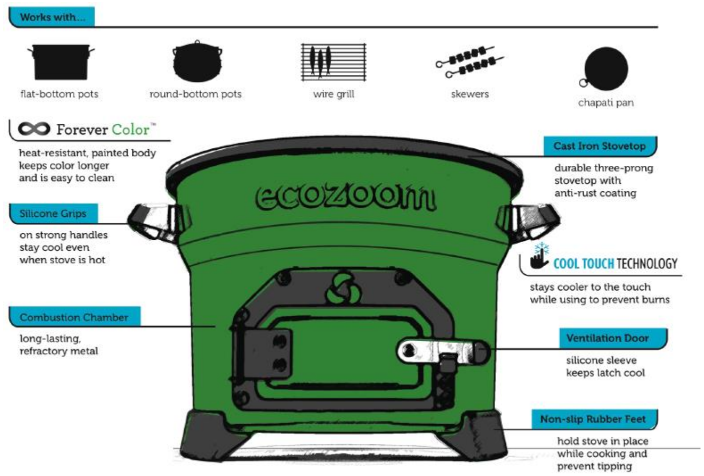
The technology has the following description:

The Zoom Jet cook stove by ecozoom is a single burner, high efficiency cookstove that delivers fuel savings up to 76% and minimizes harmful emissions of CO, CO2 and Particulate Matter. The rated thermal efficiency is 45%[12]. In the absence of the project activity, the households with improved cookstoves would have continued to use inefficient traditional cookstoves, including three-stone fired and conventional stoves built of mud/clay lacking a chimney and grate to provide energy for cooking. These stoves use charcoal as the fuel. The efficiencies of these conventional stoves are low and are of the order of 10%. The technical specifications[3] of the clean energy products are as follows:

[1] Ecozoom efficiency test results_WBT

[2] As per stove testing results (water boiling test carried out by University of Nairobi)

[3] Manufacturer's certificate on specifications



Physical dimension of the stove is provided below:

Height: 21cm

Weight: 7kg

Stove top diameter: 28cm

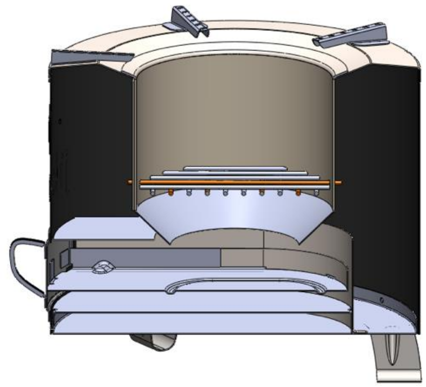
The average lifetime of the cook stove as per manufacturer's specifications is five years and the fuel used in these stoves in Charcoal.

- Burn Jikokoa G3 efficient cookstove

The technology has the following description:

The Jikokoa cook stove by burnstoves is a single burner, high efficiency cookstove that delivers fuel savings up to 50% and minimizes harmful emissions of CO, CO2 and Particulate Matter. The rated thermal efficiency is 45%. In the absence of the project activity, the households with improved cookstoves would have continued to use inefficient traditional cookstoves, including three-stone fired and conventional stoves built of mud/clay lacking a chimney and grate to provide energy for cooking. These stoves use charcoal as the fuel. The efficiencies of these conventional stoves are low and are of the order of 10%. The technical specifications[4] of the clean energy products are as follows -

[4] Manufacturer's certificate on specifications

-  

Physical dimension of the stove is provided below:

Height: 25.4cm

Diameter: 26.2cm

The average lifetime of the cookstove as per manufacturer's specification is 5 years.

Below is the summary of production process of these cookstoves.

- Punching/forming, which makes parts from raw materials, primarily sheet metal
- Powder coating, which coats the stoves
- Final assembly which is a continuous flow production line that takes parts and assembles them into finished goods

Other models of efficient cook stoves may also be offered under the project activity as long as they meet all the requirements of the methodology.

- Solar Lighting System

There will be various models of solar lighting technologies = disseminated under this project activity. Households receiving these solar lighting systems are either not connected to the grid or have intermittent electricity supply from the grid resulting in use of kerosene for lighting in the baseline scenario. The models where LED/CFL lighting system has more than one LED/ CFL lamp connected to a single rechargeable battery system, every LED/CFL lamp would be considered as one project lamp. The technology has the following description and technical specifications[5] –

1. Sun King Pro 2[6]
   The technical specifications of this product are –
   Type and Solar panel Wattage: Polycrystalline/3 W

[5] As per manufacturer's product information sheet

[6] www.lightingglobal.org/products/glp-sunkingpro2

Lighting Wattage: 1.1
Luminous flux output (Lumens): 160
Lumen maintenance (for 2,000 hours): 96%
Rated lamp life: greater than 10,000 hours
Lighting point (number of project lamps): 1
Battery type/capacity– lithium ion phosphate battery/2900mAh
Type of charge controller – NA
Solar Run time(SRT): 5.5 hours
Warranty – 2 years

All products contain a solar panel, lights as shown in the photograph –

2. Sun King Home 607
The technical specifications of this product are –
Type and Solar panel Wattage – Polycrystalline/6.3 W
Lighting Wattage: 2.64
Luminous flux output (Lumens) – 305
Lumen maintenance (for 2,000 hours): 99%
Rated lamp life: greater than 10,000 hours
Lighting points (number of project lamps) – 3
Battery Type/capacity – 5900 mAh (lithium ion phosphate battery)
Type of charge controller:
Solar Run time(SRT): 5.6 hours
Warranty – 2 years

[7] http://www.lightingglobal.org/products/glp-skhome/

3. Dlight S300
   The technical specifications of this product are –
   Type and Solar panel Wattage – Monocrystalline/1.6 W
   Lighting Wattage: 1.0
   Luminous flux output (Lumens) – 100
   Lumen maintenance (for 2,000 hours): 97.97%
   Rated lamp life: greater than 10,000 hours
   Lighting points (number of project lamps) – 1
   Battery Type/capacity – 1.8 Ah (lithium ferro phosphate battery)
   Type of charge controller: Active
   Solar Run time(SRT): 5 hours
   Warranty – 2 years

4. Dlight D20
   The technical specifications of this product are –
   Type and Solar panel Wattage – Polycrystalline/5.4 W
   Lighting Wattage: 1.7
   Luminous flux output (Lumens) – 170
   Lumen maintenance (for 2,000 hours): 97.97%
   Rated lamp life: greater than 10,000 hours
   Lighting points (number of project lamps) – 2
   Battery Type/capacity – 3 Ah (lithium ferro phosphate battery)
   Type of charge controller: Active
   Solar Run time(SRT): 7 hours
   Warranty – 2 years

5. Dlight D30
   The technical specifications of this product are –
   Type and Solar panel Wattage – Polycrystalline/10.0 W
   Lighting Wattage: 3.6
   Luminous flux output (Lumens) – 360
   Lumen maintenance (for 2,000 hours): 97.97%
   Rated lamp life: greater than 10,000 hours
   Lighting points (number of project lamps) – 3
   Battery Type/capacity – 3 Ah (lithium ferro phosphate battery)
   Type of charge controller: Active
   Solar Run time(SRT): 5 hours
   Warranty – 2 years

6. Dlight D31

The technical specifications of this product are –
Type and Solar panel Wattage – Polycrystalline/10.0 W
Lighting Wattage: 3.6
Luminous flux output (Lumens) – 360
Lumen maintenance (for 2,000 hours): 97.97%
Rated lamp life: greater than 10,000 hours
Lighting points (number of project lamps) – 3
Battery Type/capacity – 3 Ah (lithium ferro phosphate battery)
Type of charge controller: Active
Solar Run time(SRT): 5 hours
Warranty – 2 years

7. Dlight D100R
   The technical specifications of this product are –
   Type and Solar panel Wattage – Polycrystalline/9 W
   Lighting Wattage: 4.8
   Luminous flux output (Lumens) – 480
   Lumen maintenance (for 2,000 hours): 97.97%
   Rated lamp life: greater than 10,000 hours
   Lighting points (number of project lamps) – 3
   Battery Type/capacity – 9 Ah (lithium ferro phosphate battery)
   Type of charge controller: Passive
   Solar Run time(SRT): 6 hours
   Warranty – 2 years

8. Dlight D330
   The technical specifications of this product are –
   Type and Solar panel Wattage – Polycrystalline/6.5 W
   Lighting Wattage: 4.4
   Luminous flux output (Lumens) – 440
   Lumen maintenance (for 2,000 hours): 97.97%
   Rated lamp life: greater than 10,000 hours
   Lighting points (number of project lamps) – 3
   Battery Type/capacity – 6 Ah (lithium ferro phosphate battery)
   Type of charge controller: Active
   Solar Run time(SRT): 4 hours
   Warranty – 2 years

9. Dlight X740
   The technical specifications of this product are –

Type and Solar panel Wattage – Polycrystalline/30 W
Lighting Wattage: 10 W
Luminous flux output (Lumens) – 1000
Lumen maintenance (for 2,000 hours): 97.97%
Rated lamp life: greater than 10,000 hours
Lighting points (number of project lamps) – 4
Battery Type/capacity – 6 Ah (lithium ferro phosphate battery)
Type of charge controller: Active
Solar Run time(SRT): 7 hours
Warranty – 2 years

10. Dlight X850

The technical specifications of this product are –
Type and Solar panel Wattage – Polycrystalline/40 W
Lighting Wattage: 12 W
Luminous flux output (Lumens) – 1200
Lumen maintenance (for 2,000 hours): 97.97%
Rated lamp life: greater than 10,000 hours
Lighting points (number of project lamps) – 5
Battery Type/capacity – 6 Ah (lithium ferro phosphate battery)
Type of charge controller: Active
Solar Run time(SRT): 6 hours
Warranty – 2 years

All the project lamps/devices are physically protected against any environmental factors such as rain, heat, insects and ingress etc.

All the lamps under this project activity would fall under Option 2: Project lamps are assumed to operate up to seven years after the distribution to end users. Therefore, under this option, emission reductions may only be claimed up to seven years.

Other models of solar lighting systems may also be offered under the project activity as long as they meet all the requirements of the methodology.

MEC's Credit Tracker Platform is used to maintain records for the project activity. The MEC Credit Tracker Platform has been designed specifically for accelerating microfinance access to clean and efficient energy. The Credit Tracker Platform is used to collect and store the information related to the unique identification number, location, installation date, and usage status of each clean energy product (CEP) in project activity, making it easy to identify, locate and verify any or all of the installations that pertain to the project activity. The MEC Credit Tracker Platform is a hosted internet service, limiting the risk of loss of data.

The Credit Tracker Platform enables Micro Energy Credits to maintain consistent data on project activity and product installations. The process for entering data into the Credit Tracker Platform is consistent across all CEPs in the project activity. At the time of installation, a Booking Record (in paper or electronic format) is created that captures detailed data on the installation:

- Household name
- Location of household (address)
- Product type installed
- Product model installed
- Date of installation
- Unique identifier number (s) for CEPs

Once the installation is complete, it is ensured that all the data from the Booking Record created at the time of installation is accurately captured in the electronic Booking Record in the Credit Tracker Platform.

Internal checks are done to verify the accuracy of data entry and to ensure that the data captured in Credit Tracker is identical to the data recorded at the time of installation.

1.12 Project Location

The products sold will be restricted to the boundary of the Republic of Kenya. The activity will involve households across the host country. The location of each clean energy installation as per the household address or the address of the nearest bank branch that has distributed product of provided loan will be recorded in MicroEnergy Credit's Credit Tracker Platform.

1.13 Conditions Prior to Project Initiation

Refer to Section 3.4

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

As per the current applicable laws[8], a full scale EIA is not required as per the list of industries published by the Host Country[9].

There are no other local, regional or national laws that are applicable.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

This project activity is registered as CPA 3 of the CDM PoA "10341: MicroEnergy Credits – Microfinance for Clean Energy Product Lines – Africa". [10]

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project does not reduce GHG emissions from activities that are included in any emissions trading program.

1.16.2 Other Forms of Environmental Credit

The project has not sought or received any other form of GHG – related environmental credits.

1.17 Sustainable Development Contributions

The project contributes to social, environmental, economic and technological benefits which contribute to sustainable development of the local environment and the country as follows:

- Education benefits: Households will have less air pollution along with better and more reliable lighting. This will reduce the risk of air pollution-related diseases for the families and enable people to work and/or study for longer hours without straining their eyes.
- Social benefits: Reduces drudgery to women (due to reduced fuel wood use) who spend long hours and travel long distances to collect fuel wood. Provides better quality of life for the rural communities as they get more time to spend together. Economic benefits:

[8] http://www.nema.go.ke/index.php?option=com_content&view=article&id=42&Itemid=142

[9] http://www.nema.go.ke/index.php?option=com_content&view=article&id=42&Itemid=142

[10] https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/O61BMCHSUF5DGYQ4KTXIJ0EZN73RPL/view

  - Households and microentrepreneurs will achieve energy savings from reduced spending on biomass fuel and kerosene
  - Microentrepreneurs will be able to spend more time on income-generating activities due to lesser cooking times and better lighting in the evenings
  - The expansion of the clean energy supply chain to rural regions will generate jobs
- Health benefits: It will reduce health hazards from fumes from inefficient stoves and kerosene. There will also be lesser fire risks from kerosene for families and microentrepreneurs
- Environmental benefits: It will reduce emissions of greenhouse gases from usage of inefficient stoves and kerosene

1.18 Additional Information Relevant to the Project

Leakage Management

For the cookstoves component, leakage is addressed through application of a default factor of 0.95

For the solar lighting component, there are no leakage sources identified by the applied methodology. AMS.III.AR v5.

Commercially Sensitive Information

There is no commercially sensitive information

Further Information

There are no additional relevant legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and/or temporal information that may have a bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 SAFEGUARDS

2.1 No Net Harm

There are no potential negative environmental and socio-economic impacts

2.2 Local Stakeholder Consultation

The procedures or methods used for engaging local stakeholders

Local stakeholder consultation was held at Equity Centre, Upper Hill,9th Floor, Nairobi Kenya on 25th Feb 2016.

For the project level stakeholder consultation, stakeholders were invited by email and sms to attend the physical stakeholder consultation meetings held at the above address.

Outcome of the local stakeholder consultation

A detailed LSC report is prepared and would be provided to DOE mentioning the detailed account of invitation process, timelines, attendance during the meeting and accounts of comments received.

The invited stakeholders included:

- Existing customers from various locations in the boundary of the project activity
- Technology / CEP providers
- Bank representatives
- Government representatives
- Local NGO

Minutes were recorded for the consultation and a detailed stakeholder consultation report was compiled.

Stakeholder Feedback

Overall, during the meeting and in telephonic communications, the project received significant interest from stakeholders and positive feedback. The stakeholders generally felt that the project offered significant environment, development, and empowerment impacts by making proven clean energy products affordable and accessible to low-income households and microentrepreneurs. Stakeholders agreed that the project will be successful in providing affordable clean energy access to the people of Kenya.

Majority of the stakeholder felt that the project would benefit the local environment and would have positive impact on health and society at large. The specific comments received during the meeting are as follows:

Category of the Stakeholder	**Comments received**
End-user	Clean energy project will improve the lives of the society. It is also money saving venture.
Agent	Ensure proper logistics and distribution of products to agents

End-user	The project will go a long way in poverty eradication in Kenya
Agent	Add more variety of products

2.3 Environmental Impact

No EIA is carried out as it is not required per host country laws.

2.4 Public Comments

This section will be filled after the public comment period is completed.

2.5 AFOLU-Specific Safeguards

Since this is a non AFOLU project, this section is not filled.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The Project applies both of the following two approved methodologies under CDM:

- AMS-II.G: Energy efficiency measures in thermal applications of non- renewable biomass (Version 8)
- AMS-III.AR.: Substituting fossil fuel based lighting with LED/CFL lighting systems --- Version 5.0

The associated tools and guideline documents in the project activity include:

- CDM TOOL01 “Tool for the demonstration and assessment of additionality” Version 07;
- CDM TOOL21 “Demonstration of additionality of small-scale project activities” Version 13.1;
- CDM TOOL30 “Calculation of the fraction of non-renewable biomass” Version 03;
- CDM Guideline “Sampling and surveys of CDM project activities and programmes of activities” version 04;
- CDM Standard “Sampling and surveys for CDM project activities and programmes of activities” version 09.

- VCS Standard version 4.2

3.2 Applicability of Methodology

The applicability criteria of the methodologies and tools used are justified at the project activity level. This is reflected in the following tables in this section.

Methodology AMS-III.AR.: Substituting fossil fuel based lighting with LED/CFL lighting systems — Version 5.0.

The applicability conditions of this methodology are presented in the table below:

Fulfilment of AMS-III.AR. Applicability criteria:

S. No.	Applicability Condition	Justification of applicability
1	This category comprises activities that replace portable fossil fuel-based lamps (e.g. wick-based kerosene lanterns) with battery-charged light-emitting diode (LED) or compact fluorescent lamps (CFL) based lighting systems in residential and/or non-residential applications (e.g. ambient lights, task lights, portable lights).	Since the activity undertakes distribution of solar lighting systems (LED or CFL) to replace wick-based kerosene lamps, thus this meet this applicability condition
2	This methodology is applicable only to project lamps whose batteries are charged using one of the following options4: (a) Charged by a renewable energy system included as part of the project lamp (e.g. a photovoltaic system or mechanical system such as a hand crank charger); (b) Charged by a standalone distributed generation system (e.g. a diesel generator set) or a mini-grid, i.e. that is not connected to a national or regional grid; (c) Charged by a grid that is connected to regional/national grid.	Since the activity involves the lights that are charged by solar energy using solar PV which is a renewable source of energy, hence this applicability criterion is met
3	At a minimum, project lamps shall be certified by their manufacturer to have a rated average operational life of at least: (a) 5,000 hours for Option 1, paragraph 4(a); (b) 10,000 hours for Option 2, paragraph 4(b).	The activity chooses to apply option 2, and the manufacturers specification for the lighting devices under the PA would demonstrate that rated average operational life is above 10,000

		hours based on the appropriate testing results.
4	Project lamps shall meet warranty requirements of the Lighting Global Minimum Quality Standard. The project lamps shall have a warranty of a minimum of one year from the time the end-user takes ownership or begins using the lamp. At a minimum, the warranty shall cover free replacement or repair of any failed lamps, batteries, and where applicable solar panels. The warranty shall be clearly communicated and supported through the supply chain and available to end-users of the project lamps during the warranty period. In a situation where the project lamps are distributed through intermediaries, the one year warranty shall commence from the time that the project lamps are distributed to end-users. The full warranty terms shall be available in writing, in a regionally appropriate language and included with each unit.	This condition is fulfilled by the project lamps. The project lamps carry warranty of 24 months (more than 1 year) and meet the warranty requirements of the lighting global minimum quality standards. Same can be verified from the manufacturer's product specification/warranty card (in a regionally appropriate language) available with each project lamp. The manufacturer's product specification/warranty cards are available with each project lamp and hence the end-users are communicated about their warranty on the product.
5	Rated average life is the life certified by the manufacturer or responsible vendor as being the time at which the lamp's initial light output will decline by no more than 30 per cent. In addition, for project lamps charged using Option 3(c) as provided for in paragraph 3 above, the manufacturer shall certify that the battery-charging-circuit efficiency of the project lamps, at the time of the purchase, is at least 50 per cent. For project lamps charged under option indicated in paragraph 3(b), if the mini-grid or distributed generation system is not entirely powered by renewable energy generation unit(s), the manufacturer shall certify that the project lamp's battery charging circuit efficiency, at the time of purchase, is at least 50 per cent.	This condition will be fulfilled by the all the models of the lamps distributed under this activity. Rated life would be certified by the lamps manufacturer in accordance with the requirement of this condition. The project lamps are not charged either using 3(c) or 3(b) options in the methodology. All the project lamps are charged using 3(a) option.
6	Measures are limited to those that result in emissions reductions of less than or equal to 60 kt CO_2 equivalent annually.	The total emission reductions per lamp (considered as project activity) are less than the small scale threshold of 60,000 t CO_2 equivalent

		annually, as demonstrated in the ER sheet.
7	Project lamps shall meet or exceed the following minimum performance characteristics, which should be proven by third-party test results: (a) Light Output - luminous flux of 25 lumens or illuminance of 50 lux over an area ≥0.1 m2 when suspended at a distance of 0.75 meters or self-supported. The light output over a 2,000 hour lumen maintenance test should not decline by more than 15%;	Models under distribution meets and the performance exceeds these eligibility criteria based on manufacturer's product specification
8	Run Time and Battery Capacity - Daily Burn Time (DBT, also defined as solar run time) shall meet the following requirements: (i) DBT shall be equal to or greater than 4 hours; (ii) For charging Option 3(a) with solar PV, the DBT is defined by the Solar Run Time for the project lamp (as determined per paragraph 9(g)); (iii) For other technologies in Option 3(a), the DBT is defined based on typical expected patterns of use; (iv) For charging Options 3(b) and 3(c): a. The maximum claimed DBT shall be less than or equal to the typical capabilities of the regional or local energy system at delivering reliable power sufficient for recharging; b. The autonomous (full battery) run-time of the project lamps shall be equal to or greater than 200 per cent of the DBT of the project lamps; c. The project lamp shall be fully recharged from a discharged state after eight hours of charging.	DBT for the project lamps is greater than 4 hours based on manufacturer's product specification. Charging option used by project lamps is 3(a) and DBT is defined as the Solar Run Time for the project lamp. Charging options 3(b) and 3(c) have not been used in the project.
8	The project design document shall explain the proposed distribution method of the project lamps. It shall also explain how the proposed project activity shall:	The activity proposed to distribute the solar lamps through established sales

	(a) Ensure that the replaced baseline lamps are those that directly consume fossil fuel. This can be done through documentation of the common practice of fuel usage for lighting in the project region (e.g. based on representative sample surveys, official data or peer reviewed literature) that demonstrates that fossil fuel is a commonly used fuel for lighting; (b) Encourage the consumers, targeted by the project activity, to use the project lamps and discourage hoarding; (c) Eliminate potential double counting of emission reductions that could occur, for example, if more than one entity (e.g. lamp manufacturers, suppliers of solar and/or battery equipment, etc.) claims credit for emission reductions for the project lamps. At a minimum, project lamps shall be marked as CDM project lamps; (d) Ensure compliance with prevailing regulations pertaining to the use and disposal of batteries.	channel or through manufacturer sales channel. (a) Fossil fuel-based lighting is a common practice in Kenya. Also, for all the lamps distributed under the PA, type of baseline lamps and fuel used in the lamps would be recorded at the time of distribution. Only those sales would be recorded as project lamps where the baseline is identified as consumption of fossil fuel for lighting. (b) Consumers are explained about the salient features of the product and are encouraged to use the products through disseminating the knowledge of the savings on fossil fuel. Consumers spend large proportion of their income on fossil fuels and the project lamps helps them avoid this expenditure. So there is a built in incentive for users to use the project lamps. (c) Each project lamps distributed under the project is uniquely identified. For each of the lamps, records pertaining to three or more of the following identifiers: Purchaser name, household address, phone number, bank ID number, national ID number, product unique identifier number, are captured and stored in the online product database. In addition, each of the lamp distributed under the project would be

		physically marked as project lamp. A carbon title transfer form will be signed by each user, which would ensure that all carbon credits are transferred to the project implementer. (d) There are no prevalent regulations in Kenya. However, the project implementer would follow any regulations that come up during the crediting period of the PA.
9	The project design document shall include the minimum requirements for the design specifications of project lamps including the following specifications: (a) Lamp wattage (in Watts) and luminous flux output (in lumens); (b) Rated lamp life (in hours); (c) Where applicable, the type and rated capacity of the renewable energy equipment used for battery-charging (in Watts); (d) Type (e.g. NiMH, Lead-Acid, Li-ion, Lithium-iron-phosphate, etc.), nominal voltage, and rated capacity of the batteries (in Ampere hours); (e) Type of charge controller (e.g. active or passive); (f) Autonomous time and DBT; (g) Solar Run Times(s) (SRT) for products with solar energy charging systems. If regional solar data are available, the maximum, minimum and average estimated SRT values for each month of a typical year shall be provided. If regional solar data are not available the standard solar day (5 kWh/m2) shall be used to estimate SRT;	All the requisite details for each model of the solar lamp have been mentioned in this VCS PD.

	(h) Where applicable, the amount of time to fully charge the product using mechanical means or a centralized charging system (e.g. the national grid); (i) Physical protection against environmental factors (e.g. rain, heat, insect ingress).	

Option 2:	
Project lamps are assumed to operate for up to seven years after distribution to end users, and thus emission reductions can be claimed for up to seven years per project lamp, if all of the following conditions are met: (a) Unless specified otherwise in this document, the currently-applicable requirements to meet the Lighting Global Minimum Quality Standards at the time of project application shall be met by project lamps based on IEC/TS 62257-9-5 and IEC 60529, or an equivalent national standard, or the approved norms indicated in paragraph 15(h); (b) At a minimum, project lamps must be certified by their manufacturer to have a useful operational life of 10,000 hours. Within this time span, the relative luminous flux shall not decrease by more than 30 per cent as per equation (1). Such claims shall be confirmed by a third-party testing organization using an applicable standard and testing protocol. As an alternative to long-term measurement of light output over the full lifetime of the lamp, a shortened measurement period of 2,000 hours may be chosen. If a 2,000 hour test period is used, the relative luminous flux shall not decrease by more than 15 per cent during the 2,000 hours of continuous operation. If the average life value is not available ex ante, it shall be made available for verification.	Project lamps meets all the conditions to meet the sever years of crediting period as mentioned below: 1. The project lamps meet the Lighting Global minimum Quality Standards based on IEC/TS 62257-9-5 and IEC 60529. 2. The project lamps are certified with useful operational life of more than 10,000 hours. Additionally, shortened measurement of 2,000 hours have less than 5% decrease in luminous flux (which is less than 15% as per requirement). The third-party testing certificate is also provided for the models included in this project. If any new product models are implemented during the crediting period all the required criteria will be met which can be verified at the time of verification.
The project lamps use a replaceable, rechargeable battery. In addition, there must be documented measures in place to ensure that lamp owners have access to replacement batteries of comparable quality	The project lamps use replaceable and rechargeable battery. The PO also provides servicing support and access to battery replacement of

	the same quality when requested by lamp owners.
With regard to physical ingress and water protection, mechanical durability, and the quality of workmanship the project lamps shall achieve a minimum level of protection, based on the type of lamp, in accordance with Lighting Global Minimum Quality Standards, IEC/TS 62257-9-5 and IEC 60529, or an equivalent national standard, or the approved norms indicated in paragraph 15;	Physical protections standards are followed in accordance with Lighting Global Minimum Quality Standards against ingress, rain, water protection, quality of workmanship etc.
Compliance with the technical requirements in paragraph 18 are confirmed by a third-party testing organization based on appropriately sampled (random or market-selected) tests of project lamps using applicable national standards where such are available, or alternatively, the standards or test protocols indicated in paragraph 15 of this methodology may be used. The laboratory conducting and certifying the tests shall comply with the requirements of a relevant national or international standard such as ISO/IEC 17025. If the testing results are not available ex ante, they shall be made available at project verification;	Technical requirements in paragraph 18 of the methodology AMS III.A.R v5 is met and the third party testing results are provided. The samples for the tests are part of the quality check of the product where the tests are conducted on a random basis and at different environmental settings conducted in a laboratory meeting all the relevant international standards.
Project lamps shall be marked for clear, unique identification to associate them with each unique CDM project. The method to meet this requirement includes, but is not limited to, the following: (i) Permanent marking of CDM project number and name on each of the project lamps along with other specifications; (ii) Marking using special codes, for example each project is permanently marked 'for CDM project, not for sale/resale' followed by project specific marking/labelling; (iii) Other forms of identification using communication technologies (e.g. GPS, mobile phone networks) or lease/rental payment.	Project lamps can be identified with the marking of the CDM project number on the device. Additionally, all the lamps GPS locations, lease/rental payment or full address can be tracked from the MEC Credit Tracker systems.

AMS-II.G "Energy efficiency measures in thermal applications of non- renewable biomass" (Version 8)

The methodology is applicable because the project activity fulfils the following criteria:

- Introduces technologies i.e. efficient cookstoves involving the efficiency improvements in the thermal applications of non- renewable biomass in households. The various efficient cookstoves introduced in the project has an efficiency of more than 20%.
- The decline of forest in Kenya has been identified supporting the claim that the biomass usage in the baseline scenario is non-renewable and that non-renewable biomass (NRB) has been used since 31 December 1989. Between 1990 and 2005, Kenya lost roughly 12,050 hectares of forest cover per year. This translates into a rate of deforestation of 0.32 per cent per year. Of the wood used in 2005, 100 per cent came from forests. The wood was used either as industrial roundwood or woodfuel. In 2005, 1.6 million m^3 was harvested for industrial roundwood and 27.4 million m3 was used as fuelwood. In summary 94 per cent of wood removal in 2005 was to be used as fuelwood and all of it came from forests. In total the country lost 6.5 per cent of forest cover in that 20-year period[11]. Since forest cover has been decreasing steadily since 1990 it can be concluded that non-renewable biomass has been used in Kenya since 31 December 1989.
- Each household implementing a cookstove in the project is less than 1% of the Small-Scale limit of 180 GWh(thermal) applied to category II projects. For cookstoves sold as part of the project activity, each household represents about 0.001% (0.002 GWhth/180 GWhth) of the energy saving limit. According to the energy savings calculation for improved cookstoves proposed to be deployed, the project activity has a total energy saving of 172.30 GWh (thermal) which is well below the SSC limit of 180 GWh (thermal)

S.No.	Applicability Condition	Justification of applicability
1	This methodology comprises efficiency improvements in thermal applications of non- renewable biomass. Examples of applicable technologies and measures include the introduction of high efficiency biomass fired project devices (cook stoves or ovens or dryers) to replace the existing devices and/or energy efficiency improvements in existing biomass fired cook stoves or ovens or dryers.	The purpose of the project activity is to introduce technologies i.e. efficient cookstoves involving the efficiency improvements in the thermal applications of non- renewable biomass in households. The activity involves replacement of old and inefficient cook stoves with improved cook stoves.
2	In the case of cook stoves, the methodology is applicable to introduction of single pot or multi pot portable or in-situ cook stoves with rated efficiency of at least 20 per cent.	The efficient cookstove introduced in the project activity are 10,000 stove which have an efficiency of 45% as per the manufacturer's specifications and water boiling test results conducted by third parties as described in section A.3 above.

[11] Statistics: Kenya (2010, August). Mongabay.com. Retrieved from www.rainforests.mongabay.com/deforestation/2000/Kenya.htm

		Hence, the distributed stoves have an efficiency of at least 20%
3	The aggregate energy savings of a single project activity shall not exceed the equivalent of 60 GWh per year or 180 GWh thermal per year in fuel input.	Each household implementing a cookstove in the project is less than 1% of the Small-Scale limit of 180 GWh(thermal) applied to category II projects. For cookstoves sold as part of the project, each household represents about 0.001% (0.002 GWhth/180 GWhth) of the energy saving limit. According to the energy savings calculation14 for improved cookstoves proposed to be deployed, the project activity has a total energy saving of 172.30 GWh (thermal) which is well below the SSC limit of 180 GWh (thermal)
4	Non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	The decline of forest in Kenya has been identified supporting the claim that the biomass usage in the baseline scenario is non-renewable and that non-renewable biomass (NRB) has been used since 31 December 1989. Between 1990 and 2005, Kenya lost roughly 12,050 hectares of forest cover per year. This translates into a rate of deforestation of 0.32 per cent per year. Of the wood used in 2005, 100 per cent came from forests. The wood was used either as industrial roundwood or woodfuel. In 2005, 1.6 million m3 was harvested for industrial roundwood and 27.4 million m3 was used as fuelwood. In summary 94 per cent of wood removal in 2005 was to be used as fuelwood and all of it came from forests. In total the country lost 6.5 per cent of forest cover in that 20-year period[12].

[12] Statistics: Kenya (2010, August). Mongabay.com. Retrieved from www.rainforests.mongabay.com/deforestation/2000/Kenya.htm

		Since forest cover has been decreasing steadily since 1990 it can be concluded that non-renewable biomass has been used in Kenya since 31 December 1989.
5	For cases where the biomass is sourced from renewable sources, the project participants should use a corresponding Type I methodology.	Biomass is not sourced from renewable sources, hence type I methodology has not been applied.

3.3 Project Boundary

Improved Cookstove

Source		Gas	Included?	Justification/Explanation
Baseline	Emission from use of non-renewable biomass	CO_2	Yes	Primary source of emissions
		CH_4	No	Minor source
		N_2O	No	Minor source
		Other	No	Not applicable
Project	Emission from use of non-renewable biomass	CO_2	Yes	Primary source of emissions
		CH_4	No	Minor source
		N_2O	No	Minor source
		Other	No	Not applicable

Solar Lighting System

Source		Gas	Included?	Justification/Explanation
Baseline	Combustion of kerosene fuel for lighting	CO_2	Yes	Primary source of emissions
		CH_4	No	Excluded for simplification. Minor source of emissions. Conservative
		N_2O	No	Excluded for simplification. Minor source of emissions. Conservative
		Other	No	Not applicable
Project	Renewable energy source solar lighting	CO_2	Yes	Primary source of emissions
		CH_4	No	Excluded for simplification. Minor source of emissions. Conservative

Source		Gas	Included?	Justification/Explanation
	systems used for light	N_2O	No	Excluded for simplification. Minor source of emissions. Conservative
		Other	No	Not applicable

The map of the project boundary is provided in Section 1.1.

3.4 Baseline Scenario

Baseline scenario for Solar Lamps and methodology AMS-III.AR.: Substituting fossil fuel based lighting with LED/CFL lighting systems --- Version 5.0

The project activity involves the introduction of solar lighting systems into households throughout Kenya. Solar lighting systems replace the main baseline fuel, kerosene.

In Kenya, only 19% of the population is connected to the grid, leaving 34M people without access to affordable and reliable electricity.[13] This lack of grid connectivity hinders the productivity as it limits daily activities such as schoolwork, household chores, and business at night or in the early morning. Given the slow rates of electrification coupled with high population growth, the grid supply versus demand crises will only be exacerbated. 92% of rural households rely on kerosene for lighting but it is expensive and takes up a huge proportion of family budgets.[14]

Additionally, as per the lighting Africa research study, commissioned by World Bank & IFC, 83% of the respondents say that Kerosene is the main source of energy. 96% of the overall population uses Kerosene for lighting[15].

The baseline technology uses fossil fuel based lighting i.e Kerosene which will be replaced by renewable technology-solar lighting system.

Upon asking, 82% of the households responded that they do not have any other source or power than Kerosene[16]. The study also points out that due to its wide availability kerosene is the most popular source of power in many businesses, just like in many households. Candles are also used, though to a lesser extent.[17]

Further, the study summarises in the end (page 124 of the study) the key power and Lighting Habits in Kenya:

- Kerosene is the most popular source of power for lighting with 96% of households using it as the main power source

[13] https://solar-aid.org/wp-content/uploads/2016/09/Kenya-report-2014-1.pdf

[14] SolarAid Kenya Country Report 2014.

[15] Page 49 of Kenya-off-grid-lighting-market-Quantitative-study

[16] Page 54 of Kenya-off-grid-lighting-market-Quantitative-study

[17] Page 71 of Kenya-off-grid-lighting-market-Quantitative-study

- Use of light in households starts much later after dark so as to reduce the amount of time the lights are on and thus save on costs
- Only a few rooms are lit after dark (often 1 or 2), the longest lit room is the living room – where the majority of family members will gather during the evening, while the least lit is the outside; patio and toilet.
- The main problem experienced after dark is the lack of lighting; as a result, other areas of the house and personal development suffer the most
- About 7 in every 10 households say their households are poorly lit and introduction of more lights would be the ultimate solution.

To ensure that the baseline requirements of the methodology are complied with by the project activity, the PP also carried out a baseline survey to determine the baseline at time of project activity inclusion in CDM. This survey was carried out through a random representative approach by considering end-users in all counties where sales were made.

A representative sample survey (90% confidence interval, +/- 10% error margin) was carried out in the project population to determine their pre-project fuel. All respondents said that they used kerosene in wick lamps in the baseline scenario and are not connected to the grid.

A survey was conducted in January 2016 in the project boundary using 90/10-confidence precision for sampling.

Methodology for the sample survey:

1. The total sample size required to meet (90% confidence interval, +/- 10% error margin) was calculated using http://www.raosoft.com/samplesize.html.
2. The number of final samples taken will be more than the sample size required (Requirement-68 and Samples considered-70) to meet 90% confidence interval, +/- 10% error margin to cover for contingencies like residents not being in the house, residents not willing to talk etc.
3. A questionnaire will be prepared for conducting the survey. The questionnaire will include the name of the product owner, address and ask questions on what their baseline fuel was. The questions are designed to make sure that they are not leading and ensure that the respondents are not asked questions with bias.
4. MEC enumerators will visit the selected households during the day (between 9 AM and 6 PM) to ask them the questions and collect the answers

As an additional measure, since solar sales in this project activity will be made in a phased manner across several counties in Kenya, and to ensure that the baseline requirements of the applied methodology AMS III.AR v5 are met. As part of the monitoring, it will be recorded whether or not households being given the solar lighting system used kerosene in the pre-project scenario.

Only those households that used kerosene for lighting in the baseline scenario are included in the project activity for crediting.

Hence, it can be established that for households with solar lighting systems in the proposed project activity, the baseline is use of kerosene.

According to Methodology AMS III.AR v5, the default energy baseline is the use of Kerosene based wick lamps. Thus, it has been established that the project lamps would replace the Kerosene based wick lamps and thus the project can use the default baseline option under the methodology.

Baseline scenario for Improved cookstoves and methodology AMS-II.G.: "Energy efficiency measures in thermal applications of non-renewable biomass" (Version 8)

A summary of baseline information for Kenya is provided in this Section. The baseline scenario identified in this section will serve to calculate the emission reductions creditable from the introduction of improved biomass cookstoves to replace traditional unimproved stoves used for cooking and heating water for drinking purposes at the household level.

According to CDM Methodology AMS-II.G, "It is assumed that in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs". The value of fNRB,y, the fraction of woody biomass saved by this project activity that can be established as non-renewable, has been chosen as the default value for the Kenya as published on the CDM website[18].

This project applies a default value of 0.1 for parameter (efficiency of the system being replaced by projected devices of type i and batch j) because the systems being replaced are conventional systems with no improved combustion air supply or flue gas ventilation system.

Around 80% of Kenya households energy needs come from biomass (woody biomass for fuelwood and charcoal production)[19]. Firewood is the most used source of domestic energy with 68.3% of Kenya's households using firewood[20]. 87.7% of the rural population, which makes up the majority of Kenya's population, use firewood as a source of their energy, while only 10% of the urban population use firewood for their domestic energy use[21]. Charcoal use is predominant in the urban area with 80% of the urban population using charcoal as their source of energy with only a small percentage of rural population using charcoal[22]. These figures are collaborated by values

[18] https://cdm.unfccc.int/DNA/fNRB/index.html

[19] National Environmental Management Authority (2009)

[20] Kenya National Bureau of Statistics (2007), Kenya Integrated Household Budget Survey (KIHBS) 2005/2006

[21] Kenya National Bureau of Statistics (2007), Kenya Integrated Household Budget Survey (KIHBS) 2005/2006

[22] Mutimba, S. (2005): Kenya Energy Atlas, UNDP, Nairobi;. These figures are also supported by Ministry of Energy (2002): Study on Kenya's Energy Demand, Supply and Policy Strategy for Households, Small Scale Industries and Service Establishments. KAMFOR Company Limited, Final Report. Nairobi, (2002)

reported in academic literature[23], national documents[24] and various other relevant studies.[25][26] For the case of charcoal consumption, the woodfuel that is converted to charcoal is typically done so inefficiently and is often harvested illegally, despite the introduction of a permit system by the Kenyan Government. The impact on the remaining forest cover of the country is significant. For example, charcoal has been identified as one of the key reasons for the deforestation of the Mau Forest Complex, a quarter of which (some 100,000 hectares) has been destroyed since 2000[27]. The degradation and deforestation of rangelands, particularly around urban centres such as Nairobi, Mombasa, Nakuru and Kisumu has been attributed to charcoal production[28]. Over 95% of the kilns used in the country are considered to be inefficient, with conversion efficiencies in the range of just 8-20%. The high level of charcoal use also leads to health impacts due to indoor air pollution (including carbon monoxide emissions) which disproportionately affects women and children. However, the charcoal industry has also been estimated to have a turnover of US$ 375 million per annum. Thus, charcoal is a major source of energy and economic livelihood as well as a major environmental, social and economic policy challenge for the Kenyan Government. The charcoal stoves (jikos), mainly used by households in Kenya at present include a mixture of traditional metal stoves and clay or cement lined stoves based on the Kenyan Ceramic Jiko (KCJ) design. The thermal efficiencies of traditional metal stoves is as low as 10% - comparable to that of a three-stone fire.

The impact on remaining forest cover in the country is significant due to high deforestation rates that arise in order to meet energy needs of the growing population. Traditionally, open fire utilizing the 'three stone' method is the most prevalent method for cooking in rural areas. This method is quite inefficient and leads to the unsustainable usage of non-renewable biomass in the cooking process. The replacement of the traditional 'three-stone' fire method with the new efficient stoves will lead to substantial reduction of biomass usage. Based on the methodology AMS-II.G, the baseline scenario is different from the existing scenario (above), as the baseline scenario will be the use of fossil fuels for meeting similar thermal energy needs by the households.

3.5 Additionality

[23] Mahiri, L and Howorth, C.: Twenty years of resolving the irresolvable: approaches to the fuelwood problem in Kenya (2001)

[24] Ministry of Energy (2002): Study on Kenya's Energy Demand, Supply and Policy Strategy for Households, Small Scale Industries and Service Establishments. KAMFOR Company Limited, Final Report. Nairobi, (2002)

[25] GTZ (2009) Analysis of the market potential for domestic biogas in rural Kenya 24 UNEP: Kenya: Integrated assessment of the Energy Policy (2006)

[26] UNEP: Kenya: Integrated assessment of the Energy Policy (2006)

[27] Government of Kenya (2009): p. 9.

[28] Ministry of Energy (2002)

There are no laws or regulations in the geographical/physical boundary of the project requiring the implementation of the activities of the project. The activities under the project are voluntary, coordinated action by the PP.

This voluntary coordinated action implemented by the PP would not occur in absence of the project.

The action is not financially viable without the support of revenues from the sale of CERs. Financial support from the Carbon revenues is required in order to develop, disseminate, and ensure continued operation of the activity proposed under project.

Additionality is established using the EB 83, Annex 14, “tool for demonstration of additionality of small-scale project activities, version 10”. Following EB 83 Annex 14 Paragraph 11 Version 10, the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds comprises of:

a) Grid-connected and off-grid renewable electricity generation technologies;

b) Off-grid electricity generation technologies where the individual units do not exceed the specified threshold;

c) Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5 per cent of the small-scale CDM thresholds; d) Rural electrification project activities using renewable energy sources in countries with rural electrification rates less than 20 per cent.

The project makes use of the criterion c) above as all the clean energy products disseminated under the project would be the isolated units and also user group would include only of Households and SMEs. Also further, each of the equipment distributed would demonstrate that size of the particular unit is less than 5% of the small-scale thresholds. Below are the CEPs distributed under the households:

- Efficient cookstoves

- Solar home lighting systems

Therefore, the project meets the requirements of item c) under the positive list of the EB 83, Annex 14, “Tool for demonstration of additionality of small-scale project activities, version 10”.

• the project activity is composed solely of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs);

• Each unit under the project is no larger than 5 per cent of the small-scale CDM thresholds (i.e. less than the required 5 per cent of the small-scale threshold).

For demonstrating the additionality, all CEP types distributed under the project activity would have to demonstrate that they are within the threshold. e.g. below are the calculations of different CEP types:

1) Cookstoves: Additionality threshold demonstration for improved cookstoves deployed in Kenya

Parameter	Value	Units	Reference/Source
Baseline charcoal consumption in each household in the project boundary	0.367	Tonnes/year	Default value of fuel wood used as per the methodology: 0.5 tons per person per year Household Size: 4.4 person/household (http://www.arcgis.com/home/item.html?id=d8c1d70fbb2d49028e0713d425b26805) Charcoal to biomass conversion factor = 1:6
Baseline stove efficiency	0.1		As per SSC methodology AMS.II.G v8
Project stove efficiency	0.45		Water Boiling Test results
Net calorific value of biomass	0.0295	TJ/tonnes	IPCC default value cited in AMS-II.G version 8
Biomass savings	0.29	tonnes/year	Calculated
Energy saving per year	0.008	TJ/family/year	Calculated
Conversion factor	3.6	TJ/GWh	Default
Energy saved by each efficient cookstove	0.0023	G mWh/year	calculated
Energy savings threshold for additionality (5% of SSC limit of 180 GWH_{th})	9	GWh_{th}	Calculated

Hence its demonstrated that the CEP, i.e. cookstove is way below the 5% of SSC type II threshold of 180 GWh_{th}.

2) Solar Lighting systems: Additionality threshold demonstration for Solar Lighting Systems deployed in Kenya

Parameter	Units	Values	Reference/Source
SSC limit threshold	tCO_2e	60,000	As per SSC guidelines

Total number of solar devices till 60,000 tCO_2e threshold is reached		652,174	Calculated
Each solar lamp	tCO_2e	0.092	Default lamp emission factor as per methodology AMS II G version 8.0
% of total limit		0.000153333	Calculated
Emission Reduction threshold for additionality (5% of SSC limit)	tCO_2e	3000	Calculated

Hence, its demonstrated that the Emission Reduction from CEP, i.e. solar lamp is way below the 5% of SSC type III threshold of 60,000 tCO_2e per annum.

As the project activity meets the requirements of item c) under the positive list of the EB 83, Annex 14, "Tool for demonstration of additionality of small-scale project activities, version 10", it follows that the project activity is additional.

3.6 Methodology Deviations

The project does not apply any methodology deviations.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The applied methodology AMS IIG version 8.0 provides for the default baseline fuelwood consumption of 0.5 tons per person per annum. The f_{NRB} values applied are also based on the default value of 0.92 published by the host country DNA and available on CDM website.

According to the methodology

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

Where:

i	=	Indices for the situation where more than one type of project device is introduced to replace the pre-project devices[29]
J	=	Indices for the situation where there is more than one batch of project device
ER_y	=	Emission reductions during year *y* (tCO_2e)
$ER_{y,i,j}$	=	Emission reductions by project device of type *i* and batch *j* during year *y* (tCO_2e)
LE_y	=	Leakage emissions in the year *y* (tCO_2e)

$$ER_{y,i,j} = B_{y,savings,i,j} \times N_{o,i,j} \times n_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\,fuel}$$ Equation (2)

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved per cookstove device of type *i* and batch *j* during year *y* (tonnes)
$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass[30] (fraction or %)
$NCV_{biomass}$	=	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
$EF_{projected\_fossilfuel}$	=	Emission factor of fossil fuels projected to be used to substitute non-renewable woody biomass by similar consumers (tCO_2e/TJ).
$N_{0,i,j}$	=	Number[31] of project devices of type *i* and batch *j* commissioned (number)
$n_{y,i,j}$	=	Proportion of commissioned project devices of type *i* and batch *j* ($N_{0,i,j}$) that remain operating in year *y* (fraction)
μ_y	=	Adjustment to account for any continued use of pre-project devices during the year *y*

$B_{y,savings,i,j}$ would be calculated using the equation 6, as per para 20 of AMS II.G. Version 8

$$B_{y,savings,i,j} = B_{old,i,j} \times (1 - \frac{\eta_{old,i,j}}{\eta_{new,i,j}})$$ Equation (1)Equation 3

Value of $B_{old i,j}$:

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

[30] Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/methodologies/standard_base/index.html>.

[31] Project devices may be commissioned in batches. See paragraph **Error! Reference source not found.**.

As per para 44 of methodology AMS II.G., quantity of woody biomass $B_{old,i,j}$ has been determined by following approach:

Option 1: A default value of 0.5 tonnes/capita per year to be applied for the stoves using non-renewable biomass.

As per AMS II.G. Version 8, para 25(a) the following approach would be used to arrive at the loss of efficiency and the annual value of $\eta_{new,i,j}$

(a) A default schedule of linear decrease in efficiency up to the terminal efficiency assumed as 20 per cent shall be applied through the life span of the project device. For example, if the life span of project device is five years and project device has an efficiency of 30 per cent at commissioning then a 2 per cent decrease in efficiency every year shall be applied;

A linear efficiency degradation approach would be used as per para 25(a) of the methodology. As per clarification SSC_789, the ICS efficiency is assumed to start degrading from the day of commissioning/distribution. Following approach will be applied for the products included in the project activity:

Year	Stove efficiency
1 (day 1-365)	42.5
2 (day 366-730)	37.5
3 (day 731-1095)	32.5
4 (day 1096- 1460)	27.5
5 (day 1461-1825)	22.5

The decay of efficiency starts on day 1 of the operation, thus the average efficiency of year 1 does not equal the initial efficiency; rather, it is equivalent to the average efficiency for year 1. This means, for example, applicable value for stoves that operated throughout year 1 (i.e. day 1 to day 365 from the start date of the crediting period) will be the average of 45 per cent on day 1 and 40 per cent on day 365 i.e. 42.5 per cent. For any stoves, if initial or manufacturer efficiency is different from 45%, the above table will be modified accordingly.

The project activity involves the household predominantly using Charcoal as fuel. Hence a conversion factor of 6 kg of firewood (wet basis) per kg of charcoal (dry basis) has been used.

If the life span of devices is less than the crediting period it shall be demonstrated that the devices shall be replaced after the life span has ended. In such cases, if it cannot be demonstrated that the project devices will be replaced with new devices, no emission reduction can be claimed beyond the lifespan of the project devices.

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Equation for Solar Lamps as per CDM small scale methodology – AMS III.AR, version 5.0

The methodology AMS III.AR provides for a default annual baseline emissions factor for the project lamps. The following assumptions are made about the equivalent baseline lighting system:

$$DV = FUR \times O \times U \times EF \div 1000 \times LF \times n \times NTG \qquad \text{Equation (1)}$$

Where:

DV = Lamp Emission Factor (0.092 t CO2e per project lamp, assumed for ex-ante estimate)

FUR = Fuel use rate (0.03 liters/hour)

O= Utilization rate (3.5 hours/day)

U= Annual utilization (365 days/year)

EF= Fuel emissions factor (2.4 kgCO2/liter)

LF = Leakage factor (1.0)

n= Number of fuel-based lamps replaced per project lamp (1.0, assumed for ex-ante estimate)

NTG = Net-to-gross adjustment factor (1.0)

Baseline emissions are calculated as per below equation:

$$BEy = DV \times GFy \times DBy \qquad \text{Equation (2)}$$

Where:

BE_y = Baseline emissions per project lamp in year y (t CO2e)

GF_y = Grid Factor in year y chosen equal to 1.0 since solar energy is used to charge the solar lamps

DB_y = Dynamic Baseline Factor chosen as equal to 1.0 as per Option 1 given in equation (3) of the methodology (default of 1.0 is considered).

4.2 Project Emissions

Equation for Improved Cookstove as per AMS IIG version 8.0

As per Methodology AMS IIG the project activity does not result into project emissions.

Equation for Solar Lamps as per CDM small scale methodology – AMS III.AR, version 5.0

As per the methodology AMS III.AR, there are no project emissions for the projects involving solar PV as the charging option. Hence in this case the project emissions are zero.

4.3 Leakage

Equation for Improved Cookstove as per AMS IIG version 8.0

$B_{y,savings,i,j}$ is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required as per the para 32 of applied methodology AMS II.G version 8.

Equation for Solar Lamps as per CDM small scale methodology – AMS III.AR, version 5.0

Leakage factor is assumed equal to 1.0 as per the methodology.

4.4 Net GHG Emission Reductions and Removals

For Improved Cookstoves

Example calculation for ICS sales is demonstrated below.

Symbol	Definition	Value	Units	Source
Bold,i,j	Baseline charcoal consumption in each household in the project boundary	0.3667	Tonnes/year	Default value of fuel wood used as per the methodology: 0.5 tons per person per year Household Size: 4.4 person/household (http://www.arcgis.com/home/item.html?id=d8c1d70fbb2d49028e0713d425b26805) Charcoal to biomass conversion factor = 1:6
$n_{old,i,j}$	Baseline stove efficiency	0.1		As per SSC methodology AMS.II.G v8
$n_{new,i,j}$	Project stove efficiency	0.45		WATER BOILING TESTS RESULTS FOR ECOZOOM JET B & BURN JIKOKOA COOK STOVES
$f_{NRB,y}$	Fraction of non-renewable biomass	0.9200	fraction	Default value for Kenya as specified on the CDM website
NCV Biomass	Net calorific value of charcoal	0.0295	TJ/tonnes	IPCC default value cited in AMS-II.G version 8
Conversion Factor		0.00417	GWh/tonnes	Default
EF projected fossil fuel	Emission factor for the substitution of non-renewable woody biomass /	81.6	tCO2/TJ	As per AMS-II.G version 8

	charcoal by similar consumers.			
L_{NRB}	Default factor for leakage related to the non-renewable woody biomass saved by the project activity	0.95	fraction	As per AMS-II.G version 8
$B_{y,Saving,i,j}$	Quantity of charcoal that is saved	0.29	tonnes/year	Calculated
Energy savings	Energy saved by each efficient cookstove	0.0023	GWh/year	calculated
μ_y	Adjustment for usage of project devices	1	Fraction	Default value
Number of ICS	Proposed number of installations of improved cookstoves	10,000	Number	For ex-ante emission reduction calculation, it is assumed that all cookstoves distributed are being used.
ER per household		0.599	tCO2/appliance	Calculated

Thus, Emission reductions resulting from 10,000 Improved cookstoves = 10,000 * 0.599 = 5,999 tCO_2e

<u>Solar Lighting Systems</u>

To calculate total emission reductions, these must be aggregated across all lamps in use in the period under consideration. This is done using the following equations:

Annual emission reductions are calculated as:

$$ER_{y=}\sum_{i,j} N_{i,j} \times \left(BE_{y,i} - PE_{y,i,j}\right) \times \left(OF_{y,i,j}\right)$$

Where:

ER_y = Emission reductions in year y (t CO2e)

$N_{i,j}$ = Number of project lamps distributed to end users of type i with charging method j

$OF_{y,i,j}$ = Percentage of project lamps distributed to end users that are operating and in service in year y, for each lamp type i and charging method j. Assumed to be equal to 100 per cent for years 1, 2 and 3 as per the methodology.

Symbol	Definition	Value	Unit	Source
$N_{i,a}$	Number of solar lamps type i	1	Number	To be monitored
DV	Lamp Emission Factor	0.092	t CO2/project lamp	Default as per methodology AMS III.AR v5
GF	Grid Factor	1		Default as per methodology AMS III.AR v5 for the lamps using Solar PV for charging
DB	Dynamic Baseline Factor	1		Default as per methodology AMS III.AR v5in absence of relevant information
BE	Baseline Emissions per Lamp	0.092	tCO2/project lamp	$BE_y = DV \times GF_y \times DB_y$
PE	Project Emissions per lamp	0	tCO2/project lamp	Default as per methodology AMS III.AR v5 for the lamps using Solar PV for charging
OF	Percentage of project lamps distributed to end users that are operating and in service in year y, for each lamp type i and charging method j. Assumed to be	100%		Default as per methodology AMS III.AR for the first two years

	equal to 100 per cent for years 1, 2			
ER	Emissions reductions generated by all the proposed lamps in the project activity	0.092		$ER_{y=}\sum_{i\,i} N_{i,j} \times (BE_{y,i} - PE_{y,i,j}) \times (OF_{y,i,j})$

Emission Reductions resulting from 650,000 Solar lighting systems = 59,800 tCO_2e

Table Below provides the Ex-ante calculation (estimate) of net GHG emission reductions and removals:

Year	Estimated baseline emissions or removals (tCO2e)	Estimated project emissions or removals (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions or removals (tCO2e)
Year 1	63,100	0	0	63,100
Year 2	66,400	0	0	66,400
Year 3	69,700	0	0	69,700
Year 4	1,09,300	0	0	1,09,300
Year 5	1,09,300	0	0	1,09,300
Year 6	1,09,300	0	0	1,09,300
Year 7	1,09,300	0	0	1,09,300
Total	**6,36,399**	**0**	**0**	**6,36,399**

5 MONITORING

5.1 Data and Parameters Available at Validation

Improved Cookstove

Data / Parameter	$B_{old,p}$
Data unit	tonnes/person/year
Description	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	A default value of 0.5 tonnes/capita per year has been applied for the stoves using non-renewable biomass. For the stoves using Charcoal a factor of 1/6 would be applied as provided in AMS II.G. version 08
Value applied	Wood: 0.5 tonnes/capita per year.
Justification of choice of data or description of measurement methods and procedures applied	Methodology default
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$N_{p,HH}$
Data unit	Number
Description	Average number of persons served per household prior to project implementation
Source of data	Based on the literature review: http://www.arcgis.com/home/item.html?id=d8c1d70fbb2d49028e0713d425b26805
Value applied	4.4

Justification of choice of data or description of measurement methods and procedures applied	Established ex ante prior to project implementation
Purpose of Data	Calculation of baseline emissions
Comments	-
Data / Parameter	$B_{old,HH}$
Data unit	tonnes/household/year
Description	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	Determined ex ante based on calculations
Value applied	Wood: 2.2 tonnes/household per year Charcoal: 0.366667 tonnes/household per year
Justification of choice of data or description of measurement methods and procedures applied	Using following calculations: 1. $B_{old,p}$ times $N_{P,HH}$
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$B_{old,i,j}$
Data unit	tonnes/year
Description	Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type i and batch j
Source of data	This parameter shall be determined ex ante
Value applied	Wood: 2.2 tonnes/household per year Charcoal: 0.366667 tonnes/household per year

Justification of choice of data or description of measurement methods and procedures applied	$B_{old,HH}$ divided by $N_{d,HH}$
Purpose of Data	Calculation of baseline emissions
Comments	$B_{old,i,j}$ equals $B_{old,HH}$ when only one project device per household is distributed. This would only involve households where once device would be distributed hence $B_{old,i,j}$ equals $B_{old,HH}$

Data / Parameter	Life Span
Data unit	Years
Description	State the operating lifetime of project device for projects opting Equation 6 (above) for updating project stove efficiency during project crediting period.
Source of data	Manufacturer's specifications
Value applied	10 years
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	N/A
Comments	N/A

Data / Parameter	$NCV_{biomass}$
Data unit	TJ/tonne
Description	Net calorific value of biomass
Source of data	The net calorific value of wood & charcoal is as given in 2006 IPCC Guidelines Reference: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html

Value applied	Wood: 0.015 Charcoal: 0.029
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of baseline emissions
Comments	The parameter is fixed for the entire crediting period.

Data / Parameter	$EF_{projected\_fossilfuel}$
Data unit	tCO2/TJ
Description	Emission factor: substitution of non-renewable biomass by similar consumers
Source of data	AMS IIG ver 8.0
Value applied	81.6 tCO2/TJ
Justification of choice of data or description of measurement methods and procedures applied	N/A
Purpose of Data	Calculation of emission reductions
Comments	N/A

Data / Parameter	L_{NRB}
Data unit	Fraction

Description	Fraction to account for leakage related to the non-renewable woody biomass saved by the project activity
Source of data	Default as per AMS II G version 8.0
Value applied	0.95
Justification of choice of data or description of measurement methods and procedures applied	According to the methodology, default factor of 0.95 can be used to account for leakage related to the non-renewable woody biomass saved by the proposed project
Purpose of Data	Calculation of emission reductions
Comments	N/A

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of woody biomass saved by the project activity during year y that can be established as non-renewable biomass
Source of data	The default value for Kenya published at the CDM website: https://cdm.unfccc.int/DNA/fNRB/index.html
Value applied	The $f_{NRB,y}$ value for Kenya is 0.92
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of Data	Calculation of baseline emissions
Comments	N/A

<u>Solar Lighting System</u>

None

5.2 Data and Parameters Monitored

Improved Cookstove

Data / Parameter	$N_{y,i,j}$
Data unit	Number
Description	Number of project devices of type i and batch j operating during year y
Source of data	Monitoring surveys
Description of measurement methods and procedures to be applied	Measured directly or based on a representative sample. Sampling standard shall be used for determining the sample size to achieve 90/10 confidence precision. A discount shall be applied based on the percentage of devices operational as determined by the sample survey e.g. if survey shows that 10% of the devices is non-operating, an adjustment factor of 0.9 shall be applied to number of project devices commissioned in a particular batch. Separate samples shall be taken for each batch.
Frequency of monitoring/recording	Atleast once every two years
Value applied	5,000 (for ex-ante estimation only)
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of emission reductions
Calculation method	N/A
Comments	Proportion of operational stoves obtained from the survey is multiplied by the total commissioned stoves to arrive at this value.

Data / Parameter	Date of commissioning of batch j
Data unit	Date
Description	To establish the date of commissioning, the devices will be grouped in “batches” and the latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch.

Source of data	Internal records
Description of measurement methods and procedures to be applied	As per the dates captured in tracker database
Frequency of monitoring/recording	Recorded once at the time of commissioning/distribution of the last project device in the batch
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of emission reductions.
Calculation method	N/A
Comments	To be reported in Monitoring Report

Data / Parameter	Date of commissioning of project stove i
Data unit	Date
Description	Actual date of commissioning of the project device.
Source of data	Internal records
Description of measurement methods and procedures to be applied	As per the dates captured in tracker database
Frequency of monitoring/recording	Recorded once at the time of commissioning/distribution.
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of emission reductions.
Calculation method	N/A

Comments	N/A

Data / Parameter	$Stove_{baseline}$
Data unit	-
Description	This parameter would capture the type of each baseline stove that is being replaced with the project stoves, and would ensure that only inefficient cookstoves are being replaced.
Source of data	Monitoring
Description of measurement methods and procedures to be applied	Tracked directly at the time on new and efficient stove distribution based on the response by the users/customers of the new stoves
Frequency of monitoring/recording	*N/A*
Value applied	N/A
Monitoring equipment	N/A
QA/QC procedures to be applied	*N/A*
Purpose of data	Calculation of Baseline emissions
Calculation method	N/A
Comments	This is to ensure that methodological requirement of replacement of only old and inefficient stoves is being met.

Data / Parameter	$n_{old,i,j}$
Data unit	Fraction
Description	Efficiency of pre - project device, which are the conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney.
Source of data	Based on monitoring of devices replaced

Description of measurement methods and procedures to be applied	Based on the parameter $Stove_{baseline}$ as defined above
Frequency of monitoring/recording	Once for each household when included in the project activity database
Value applied	0.1
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of baseline emissions
Calculation method	N/A
Comments	Once determined, $n_{old,i,j}$ will remain fixed for the entire crediting period.

Data / Parameter	$n_{new,i,j}$
Data unit	Fraction
Description	Efficiency of the device of each type i and batch j implemented as part of the project activity
Source of data	This will be determined each year as per para 25 (a) of the methodology AMS IIG ver 8.0
Description of measurement methods and procedures to be applied	A linear efficiency degradation approach has been used as per para 25(a) of the methodology. As per clarification SSC_789, the ICS efficiency is assumed to start degrading from the day of commissioning/distribution. Following approach will be applied for the products included in the program:

Year	Stove efficiency
1 (day 1-day 365)	42.5
2 (day 366-day730)	37.5
3 (day 731- day 1095)	32.5
4 (day 1096- day 1460)	27.5

	5 (day 1461-day 1825) | 22.5 Any other devices included would follow the same efficiency degradation approach which assumes that efficiency degradation starts from day 1. This is in line with the approach suggested by SSC_789 and is accurate and conservative. It is more accurate and conservative to consider a drop in efficiency throughout any given year of the crediting period: - The average efficiency of a given year is applied for the entire year, calculated as the mid-value between the efficiency values at the start and end of that year. - Efficiency at any other point in the year can be linearly interpolated. - The decay of efficiency starts on day 1 of the operation, thus the average efficiency of year 1 does not equal the initial efficiency; rather, it is equivalent to the average efficiency for year 1. This means, for example, applicable value for stoves that operated throughout year 1 (i.e. day 1 to day 365 from the start date of the crediting period) will be the average of 45 per cent on day 1 and 40 per cent on day 365 i.e. 42.5 per cent.
Frequency of monitoring/recording	(i) Recorded at the time of commissioning/distribution (ii) Adjusted for the loss of efficiency as per option (a) in para 25 of the methodology: A default schedule of linear decrease in efficiency up to the terminal efficiency assumed as 20 per cent shall be applied through the life span of the project device. For example, if the life span of project device is five years and project device has an efficiency of 30 per cent at commissioning then a 2 per cent decrease in efficiency every year shall be applied;
Value applied	0.45
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of Data	Calculation of baseline emissions
Calculation method	As per para 25 (a) of the methodology AMS IIG ver 8.0
Comments	If the efficiency of the project devices falls below 20%, it is no longer eligible to be considered a project device and it will be restricted from further crediting.

Data / Parameter	μy

Data unit	Fraction
Description	Adjustment to account for any continued use of pre-project devices during the year y
Source of data	MEC Tracker database
Description of measurement methods and procedures to be applied	This parameter would be monitored using following methods: 1. If the pre-project devices are decommissioned and no longer used, as determined by the monitoring survey its value is 1.0. If both the project devices and pre-project devices are used together, measurement campaigns shall be undertaken using data loggers such as stove utilization monitors (SUMs) which can log the operation of all devices (recording the situation of the device being used or not during any day 'd' of the measurement campaign) in order to determine the average device utilization intensity (to establish the relative share of the usage of the devices). The measurement campaign shall be conducted in at least 10 randomly selected participant households of the project activity for at least 90 days during the year y. If seasonal variation is observed, the average value determined through the campaign shall be annualised taking into account seasonal variation of device utilization. 2. Alternatively, surveys may be conducted if the use of data loggers to record the continued operation of baseline devices is demonstrated to be not practical, for example when the baseline device is the three stone fire. The surveys should be designed to capture the cooking habits and stove usage of households in the region, including quantification of use of baseline devices, by formulating questions and/or collecting evidences to determine the frequency of usage of both the project devices and baseline devices. For example if there were 3 pre-project devices per household and it was determined during the survey that use of one of them continues during the crediting period then a conservative adjustment factor of 0.66 is applied for the relevant monitoring period. Another example would be the case where there was only one pre-project device per household and its use during the project period continues along with the project stove to meet 25% of the cooking needs of the household in which case the adjustment factor will be 0.75. Where a more precise data is available i.e. the thermal capacity of the project and pre-project devices and respective utilisation hours, a weighted average adjustment factor may be used

Frequency of monitoring/recording	Atleast once every two years
Value applied	1.0 (ex-ante)
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of Data	Calculation of baseline emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$N_{d,HH}$
Data unit	Number
Description	Number of project devices distributed per household
Source of data	MEC Tracker platform
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Recorded at the time of commissioning/distribution of project devices
Value applied	1
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	-
Calculation method	N/A
Comments	N/A

Solar Lighting System

Data / Parameter	$N_{i,j}$
Data unit	Number of lights
Description	Number of lights distributed to end users, i, type, j
Source of data	MEC tracker platform
Description of measurement methods and procedures to be applied	The data will be recorded in a web-based tracker platform. The data will consist of unique number, number of units sold, to whom and where.
Frequency of monitoring/recording	Annual
Value applied	650,000
Monitoring equipment	N/A
QA/QC procedures to be applied	Each solar lighting system, and number of solar lamps in each system, will be recorded in the MEC Tracker System. Associated data will reside in the MEC Tracker Database, allowing each installation to be monitored.
Purpose of data	Calculation of baseline emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	GF_y
Data unit	Fraction
Description	Grid factor in year y
Source of data	AMS III.AR, version 05.0
Description of measurement methods and procedures to be applied	In line with para 27 of the methodology, this parameter has been considered equal to 1.0 as charging option deployed is the Solar Charging.
Frequency of monitoring/recording	Default value

Value applied	1
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of baseline emissions.
Calculation method	N/A
Comments	N/A

Data / Parameter	DB_y
Data unit	Fraction
Description	Dynamic baseline factor in year y
Source of data	AMS III.AR, version 05.0
Description of measurement methods and procedures to be applied	Option 1: default of 1.0 in the absence of relevant information *Option 2: value of 1.0+FFg where FFg is the documented national growth rate of kerosene fuel use in lighting from the preceding years (use the most recent available data for a three or five years average (fraction))*
Frequency of monitoring/recording	Default value
Value applied	1 (ex-ante)
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of baseline emissions.
Calculation method	N/A
Comments	N/A

Data / Parameter	$OF_{y\ i,j}$
Data unit	Fraction

Description	The percentage of project lamps distributed to end users that are operating and in service
Source of data	AMS III.AR, version 05.0
Description of measurement methods and procedures to be applied	See comments below.
Frequency of monitoring/recording	Monitoring survey to be conducted in 3rd year of crediting period.
Value applied	100% for years 1, 2 and 3 Based on monitoring surveys for years 4, 5, 6 and 7
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of emission reductions.
Calculation method	N/A
Comments	The result of a sampling survey of the first batch will be used as a proxy to subsequent batches (e.g. the operating rate in year 4 for the project lamps installed in year 1 will be used for the operating rate in year 5 for the project lamps installed in year 2. Ex-post monitoring surveys to determine percentage of project lamps distributed to end users that are operating and in service shall be conducted during the third year of the crediting period. While the percentage of project lamps that are operating and in service can be assumed to equal 100 per cent in year 1, 2, and 3, the result of ex post monitoring survey undertaken during the third year shall be used in years 4, 5, 6 and 7.

Data / Parameter	$Lamps_{baseline}$
Data unit	Fuel type consumed in the baseline lamps
Description	This parameter would capture the fuel type used in baseline lamps that are getting replaced with the project lamps. Project

	lamps will only be distributed to the households that are using fossil fuel for lighting in the baseline lamps
Source of data	MEC Tracker platform
Description of measurement methods and procedures to be applied	The lamp used in baseline lamp would be recorded in the database on the basis of information provided by the user
Frequency of monitoring/recording	Once at time of distribution of project devices
Value applied	100% fossil fuel
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	This is to fulfil the methodology applicability criterion; that each lamp replaced would ensure that baseline fuel is fossil fuel
Calculation method	*N/A*
Comments	This is to ensure that methodological requirement of replacement of only fossil fuel fired lamps is being met. This is not used directly in emission reduction equation. A particular project lamp would be counted only if fossil fuel consuming baseline lamp is getting replaced as monitored by this parameter.

Data / Parameter	DV
Data unit	tCO_2
Description	Annual emission factor for the baseline lamp
Source of data	Internal records
Description of measurement methods and procedures to be applied	Number of baseline lamps replaced per project lamp is recorded during distribution of project devices
Frequency of monitoring/recording	Once at time of distribution of project devices
Value applied	0.092 (for ex-ante estimation only)

Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of Data	Calculation of baseline emissions
Calculation method	Based on equation (1) in section 4.1 above.
Comments	This is based on calculation provided in the methodology based on fuel use rate (0.03 litres/hour), Utilization Rate (3.5 hours/day), Annual Utilization (365 days/year), Fuel Emission Factor (2.4 kgCO2/litre), Leakage Factor (1), Number of lamps replaced per project lamp (1.0 or more) & Net to gross adjustment factor of 1.0. Number of baseline lamps replaced per project lamp will be monitored during distribution of project devices and value of 'DV' will be calculated accordingly.

5.3 Monitoring Plan

Monitoring for project activity is described below. The monitoring activity provides a framework for project preparation and monitoring processes that will be undertaken at the project level.

This schedule takes into account the key parameters that are needed during the crediting periods of the project. All required monitoring and documentation would be implemented, reported, consolidated and managed by the PP or a qualified expert partner to meet verification requirements. Monitored data will be stored in a suite of monitoring databases. These will be updated each monitoring period:

The methods for measuring, recording, storing, aggregating, collating and reporting data and parameters

1. PP keeps a record of all the CEPs it installs in the MEC Credit Tracker Platform. The record includes the name, date of installation, model of CEP and ID number of the user and mobile number of the user. All records are screened by the PP and crosschecked with the on-ground records to confirm the installation record is authentic and no double counting occurs.

2. The values of the two emission reduction parameters required for ex-post ER calculation (efficiency of CEPs ($n_{new,i,j}$), number of CEPs still operating are found from sampling of CEP installations

3. The records kept in the MEC Credit Tracker Platform relate to paper copies of title transfer agreements received from individual households.

The organizational structure, responsibilities and competencies of the personnel that will be carrying out monitoring activities

PP establishes a marketing and lending program for CEPs. This program engages its own staff, as well as local distributors, technicians, and other service providers to effectively market the Clean Energy Products (CEPs) to clients (households). PP followed the monitoring plan and procedures to identify each CEP sold during the project so that the appropriate amount of emissions reductions can be claimed.

Within MEC, the person responsible for carrying out the carbon tasks is the Carbon Operations Manager. This individual is trained using the MEC user manual, which specifies how to complete the inclusion process. This individual has sufficient experience with CDM projects and terminology to successfully carry out the duties. The PP has ensured that Carbon Operations Manager received relevant training and has all necessary competencies to accurately assess and oversee the inclusion process, including the following:

- Knowledgeable on issues relating to Additionality
- Adept at ensuring protocol is followed to prevent double counting

Sampling Approach

The sampling approaches described above follow the CDM Standards for sampling.

Generalities:

The Project proponent will coordinate all ex-post monitoring activities in the project activity. The PP is ultimately responsible for implementing the monitoring plan, ensuring the quality of data obtained and the use of this data for emissions reduction calculations. However, the actual field measurements to be conducted during monitoring (e.g. testing of ICS selected during sampling) will most likely be performed by third parties contracted to the PP. In the case of using contractors, however, the PP will still be responsible for setting the procedures and providing oversight and training to the contractors. The choice between conducting the actual monitoring activities itself or employing another organization (for example, local marketing firm, university etc) will depend on locational, operational factors and financial factors. In any case, a local partner will be important for providing local insight in questionnaire design, interview technique and for gaining physical access to project beneficiaries to obtain accurate results during monitoring. Monitoring shall be carried out by the operating entity of the project activity according to the procedures and monitoring framework established below and will be submitted to the managing entity. The PP will store the data in an electronic database.

Primary data will be stored by the implementing entities/operators: The MEC Credit Tracker Platform is used to keep detailed records of all installations under the project. Each installation is monitored annually to check usage status. The Project shall monitor a representative sample of households that have received both stoves and water technologies. All monitoring records are maintained in the Credit Tracker Platform.

1. The PP maintains in the Credit Tracker Platform a record of all clean energy products that are installed

2. The emissions parameters required for ex-post management are also maintained in the Credit Tracker Platform. These include the number of solar lighting systems still in operation, and then performance of

the solar lighting systems. These parameters are determined through a sampling study as described above.

3. The PP uses the Credit Tracker Platform to cross-check the new records with the existing Platform in order to confirm that the installation record is authentic and that no double-counting occurs.

4. The electronic files holding installation records are backed up on the Internet, reducing risk of any loss of data.

5. All monitored data required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of CERs for the project activity, whichever occurs later. The unique system ID number which is linked to a gps location and/or verified address eliminates any risk of double-counting between project activities

Quality Assurance/Quality control

PP will undertake the following strategies, tailoring the specific approach to the local circumstances:

1) Ensuring end user awareness. At the time of sale, the CEP customer is made aware that they are required to participate in monitoring activities. This will be via training sales personnel to explain the importance of monitoring to each customer, and during regularly scheduled microfinance group meetings for end-users.

2) Questionnaire design. The design of the questionnaire will ensure that the questions are non-intrusive and easy to understand for both the interviewee and interviewer.

3) Drawing on local knowledge. The local contractors to be hired by the PP in each region will play an important role in tailoring the approach to suit local circumstances. For example, in some instances, it may be essential for a local person to conduct the interview in order to obtain accurate results.

4) Quality of contractors. Any third parties hired by the PP to carry out sampling will be required to demonstrate a high level of cultural awareness, local language skills and appropriate experience with data entry and data management. PP will ensure that contractors are adequately trained for the tasks they are contracted for (eg. carrying out of WBTs in line with a methodology supported by an appropriate international body such as PCIA). Training will also be provided on how to deal with non-responses, refusals and other problems should these occur.