Programme of activities design document form
(Version 09.0)

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

BASIC INFORMATION	
Title of the PoA	KOKO Kenya - Ethanol Cookstoves Program
Version number of the PoA-DD	07
Completion date of the PoA-DD	19/03/2021
Coordinating/managing entity	KOKO Networks Limited
Host Parties	Republic of Kenya
Applied methodologies and standardized baselines	AMS-I.E. Version 09.0 - "Switch from non-renewable biomass for thermal applications by the user"
Sectoral scopes	01: Energy industries (renewable - / non-renewable sources)

PART I. Programme of activities (PoA)

SECTION A. Description of PoA

A.1. Purpose and general description of PoA

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This Programme of Activities (PoA) is focused on promotion and distribution of bioethanol based clean cookstoves (technology/measure) to households and SMEs in Kenya.

Kenya is an emerging republic in Sub-Saharan Africa (SSA) with steady economic growth owing to small economic base and stable macro-economic parameters. The GDP mix of Kenya has been fluctuating widely with major dependence on services dominated by tourism, telecommunications and transport. Despite the recent spur in growth, the country lags on key development indicators placing it in the last 25 percentile (Ranking 142 of 189 countries[1]) of the countries in United Nation's Human Development Index (HDI) 2017. The penetration and intensity of energy use in Kenya, which is a key indicator of inclusive economic growth and development, is still pretty low as compared to the developed and transitional economies. The population of Kenya is highly dependent on woody biomass for household cooking use due to limited penetration of modern cooking fuel across the country. The energy demand for cooking purpose is mainly met through fuelwood and charcoal with high dependence of rural areas and urban areas on fuelwood and charcoal respectively[2]. Despite adverse socio-environmental impacts of traditional fuel usage and cooking practices like respiratory diseases, carbon emissions, and deforestation, the use of woody biomass continue to prevail in Kenya due to many constraining factors like availability of modern cooking appliances, availability and affordability of these fuels.

The purpose of this small-scale Programme of Activities (PoA) is to achieve widespread commercial use of bioethanol as clean cooking fuel by effective use of efficient cooking technologies in low-income households as well as institutions including small-scale industries and commercial set ups like catering services, street food outlets and restaurants. The operation of the PoA will result in reduction of carbon-dioxide emissions to the atmosphere caused by consumption of non-renewable woody biomass and prevention of associated deforestation, thereby contributing towards climate change mitigation. The implementation of PoA will also derive other social and environmental benefits which are discussed later in this section.

KOKO Networks Limited (hereinafter referred as "KOKO") is the **Coordinating and Managing entity (CME)** for this PoA and has devised an end-to-end clean cooking solution by deploying an innovative technology platform. As part of the implementation plan, KOKO will enable distribution of high efficiency bioethanol cookstoves and last-mile delivery of bio-ethanol fuel to the target customers using cloud systems and internet-of-things (IoT) technology.

KOKO's clean fuel solution, the "KOKO Cooker" kit consists of a two-burner bioethanol stove and a durable 'smart' canister equipped with an NFC chip that enables tracking of household-level fuel purchases. To create affordable and reliable access to bioethanol clean cooking fuel, KOKO has developed first-of-its-kind technology to lower distribution costs by launching a network of cloud-connected "KOKOpoint" fuel ATMs across Kenya. These KOKOpoints enable customers to use their smart canisters to refill with convenience at local corner shops. Customers can buy their KOKO Cookers by completing one-time registration process and ordering it on the KOKOpoint tablet screen,

1 http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/KEN.pdf

2 National Economic Survey 2018, Kenya

via the myKOKO mobile app. Customers can also take advantage of the savings scheme launched on the KOKO platform, which enables low-income customers who have difficulty with the upfront cost of the KOKO Cooker to make progressive payments towards their stove. KOKO's smart distribution platform allows purchase of bio-ethanol fuel through a digital billing system in bundles of as low as $0.30, without charging any additional cost on the fuel, thereby eliminating the "poverty penalty" often charged to low-income consumers who buy fuel in small units.

The PoA would rely heavily on carbon financing for its implementation and expansion. Each CPA will be developed with support from a Korean investor who will finance all the implementation costs of the CPA. CPA1 has been financed by ECOEYE Co., Ltd. and CPA2 financed by Pine Tree Carbon LLC. The funds from Korean investors enable households to access KOKO Cooker Kits at a subsidised price which is critical to make them affordable. The funds also support the operation & maintenance expenses of the bioethanol cookstove supply chain to enable each CPA to operate in a financially sustainable condition.

In East Africa, Bio-ethanol containing 96% pure ethanol is produced from the fermentation of molasses – an agro-industrial by-product from processing sugarcane into sugar[3]. In fact, Kenya is the largest sugarcane producing country in East Africa[4] and hence utilize the easily available molasses as raw material for bioethanol production which is primarily consumed in alcoholic beverages industries after further purification. It shall be noted that bioethanol is a regular commodity which is frequently traded in international market in large quantities. The trade volumes of alcohol in Kenya is provided below.

Alcohol (incl. Beverage and Non-Food) Trade Volumes in Kenya for 2011-2013				
	Unit	**2011**	**2012**	**2013**
Total Alcohol Export	'000 tonnes	25.0	25.0	26.0
Total Alcohol Import	'000 tonnes	8.0	8.0	9.0
Domestic Alcohol Production	'000 tonnes	43.0	45.0	44.0
Net Alcohol Export	'000 tonnes	17.0	17.0	17.0
% Alcohol Net Exports	%	39.5%	37.8%	38.6%

Source: FAOSTAT (http://www.fao.org/faostat/en/#data)

The above data shows that a large portion of the alcohol (bioethanol) is exported in Kenya which indicates surplus production of bioethanol (alcohol) as compared to domestic demand. Further, more than 90% of the domestic consumption is in the alcoholic beverages industries which indicates negligible consumption of bioethanol as industrial raw material or fuel[5]. Hence, bioethanol as cooking fuel can be one of the most sustainable fuel as it would not lead to any food security issue or diversion of critical or non-neutral resources with respect to GHG emissions.

The PoA is a purely voluntary activity by the CME. There are no national or sectoral laws/policies mandating the adoption and/or dissemination of clean bioethanol cookstoves in Kenya. Therefore, the proposed PoA is a voluntary action by the CME.

Sustainable Development Benefits

Impact on the Environment

- Climate Change: The new cooking solution will allow Kenyan households to switch to clean energy and high efficiency modern appliances. The bio-ethanol cook stoves is a clean

[3] Pg. 10, Bioethanol in Africa: The case for Technology Transfer and South-South Co-operation by IRENA

[4] Pg 130, Baseline Report of Clean Cooking Fuels in the East African Community by GAIA

[5] Break-up of Alcohol for Beverage and Non-Food purpose from FAOSTAT (http://www.fao.org/faostat/en/#data)

renewable fuel and will reduce the amount of fuel required to cook, thereby resulting in less Greenhouse gas (GHG) emissions.

- Indoor Air Quality: Through the introduction of the more efficient clean stoves, this PoA will result in the reduction of pollution caused by particulate matter (PM) released during the burning of traditional fuels (biomass and charcoal).

- Natural Resource Use: The use of fuelwood and charcoal for cooking results in large scale deforestation in Kenya each year. The introduction of bio-ethanol cookstoves will result in a reduction in deforestation as reliance on non-renewable fuel sources will be reduced.

Impact on Society

- Poverty Alleviation: The implementation of PoA will reduce monthly energy expenditures, improve health conditions, and increase household productivity in Kenya, thereby increasing the disposable income and savings.

- Health: The new stoves reduce particulate matter emissions and families no longer inhale indoor smoke that causes respiratory illnesses and the risk of burns from falling into fires is reduced. The solar lighting technology will decrease household consumption of kerosene which will reduce smoke inside households. These will have a positive effect on the health of the project participants who will inhale less smoke.

- Ecological Conservation: The implementation of this project increases awareness amongst project participants about contribution of forests and its conservation.

Impact on Economy and Technology

- Energy Security: The project will result in massive reduction in unorganized production of charcoal which remained unaccounted in the economic activities. The project will help assimilate majority of household energy consumption in economic planning and use of bioethanol will help country move to a more sustainable way of energy production, thereby ensuring long-term energy security for the country.
- Transfer of Technology and Knowhow: The assembling of KOKOpoints (fuel ATMs) is undertaken primarily by Kenyan staff with technical assistance from international staff, thereby developing know-how and expertise about the technology.

A.2. Physical/geographical boundary of PoA

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The geographical boundary for the PoA is defined by the geographical boundary of the country "Republic of Kenya".

Geo-Coordinates of Kenya

Southern-most point of Kenya	4°38'47.4"S 39°12'31.6"E
Western-most point of Kenya	0°06'58.9"N 33°57'35.3"E
Eastern-most point of Kenya	3°55'51.6"N 41°51'59.9"E
Northern-most point of Kenya	4°28'42.5"N 35°52'31.8"E

A.3. Technologies/measures

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The PoA involves distribution of bioethanol fuel cookstoves and promote its use for cooking purposes in households and institutions falling in the SME category in Kenya by leveraging cloud systems and internet-of-things (IoT) technology for last-mile delivery of bio-ethanol fuel to allow low cost affordable access of clean fuel. The technological measure will result in displacement of high GHG-emitting woody biomass as cooking fuel in the low-income households and commercial spaces of Kenya.

The procurement of the cookstoves for the PoA will comply with the national regulation on ethanol cookstoves – "Ethanol Fuelled Cooking Appliances Specifications"[6]. As an illustration, the "KOKO Cooker" stove kit consisting of a two-burner stove and a durable 'smart' canister, with thermal efficiency of 60% and thermal output of 2.1 kW (against the requirement of 45% efficiency and 1.4 kW output) fully comply with the above standard. The detailed specification are as follows:

Description	2-burner Bio-ethanol stove for domestic cooking purposes
Fuel Denatured	Bio-ethanol Cooking Fuel (95% ethyl alcohol, 5% water; 22 MJ/kg lower heating value)
Firepower	2100 Watts on MAX flame setting; 1000 Watts on MEDIUM; 500 Watts on LOW

[6] Kenya Standard: Ethanol fueled cooking appliances – Specification (KS 2759:2018 – ICS 97.040.20)

Overall Efficiency	60% (energy content of fuel transferred to contents of pot; as defined by ISO WBT methodology)
Fuel Capacity	2.4 Litres fuel capacity within stove
Burn Time	2.5 hours per burner on MAX setting (5 hours per burner on LOW setting) for fully fuelled stove
Expected Service Life	10 years with routine annual maintenance
Box Dimensions	90 cm (width) x 33 cm (depth) x 20 cm (height) ; with carry handle Box Weight (gross) 8 kg

The CME may also utilize other bioethanol cookstove models with single or multiple burners complying to the national regulation on ethanol cookstoves – "Ethanol Fuelled Cooking Appliances Specifications". The CME will ensure that the thermal output of each cookstove distributed under the PoA shall not be higher than 1500 kW. Hence, all cookstoves under the PoA will qualify as "CDM micro unit" thereby demonstrating the additionality of PoA (please refer section C).

Procurement Plan for Bio-Ethanol

KOKO Networks has partnered with reputable Fuel Traders and Fuel Marketing Company (FMC) which procures renewable bioethanol for Kenya. Currently, KOKO Networks has tied up with Vivo Energy for procurement of fuel. The FMC will be responsible for continuous supply of bioethanol upto local fuel stations within network areas of KOKO. KOKO's operational boundary involves off-take of fuel from FMC fuel stations to KOKOpoints, continuous operations of fuel ATMs/KOKOpoints, distribution of KOKO Cookers and repair & maintenance of KOKO cookers.

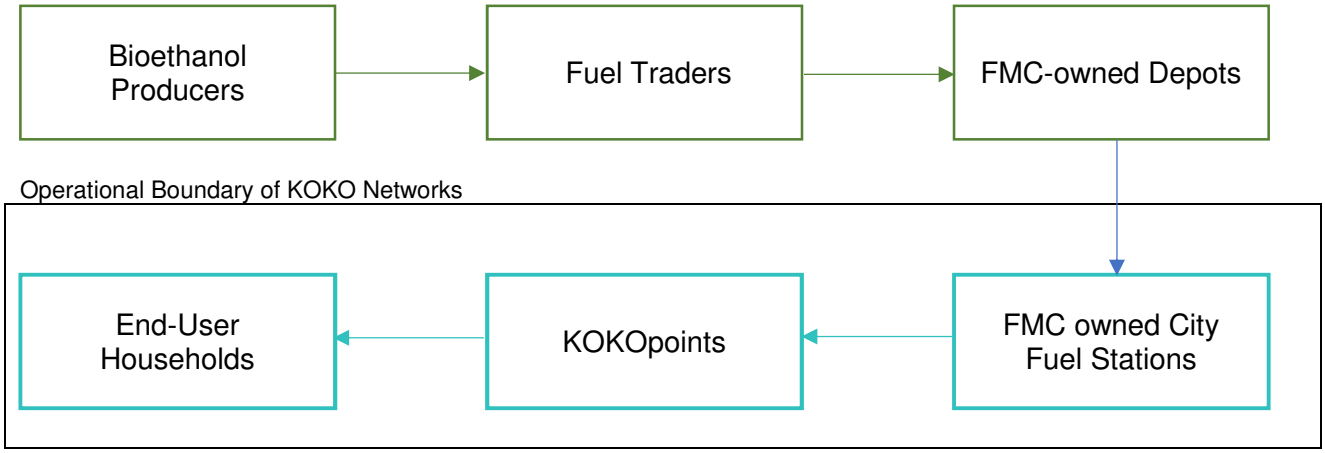

Fig. 1: Bioethanol fuel Logistics Supply Chain

Bioethanol in Kenya and whole of East Africa is produced through the distillation of molasses, which is a waste product from the sugar production process[7]. One of the reasons for establishing the PoA in Kenya was the high production of sugarcane in the country and the neighbouring countries ensuring reliable supply of bioethanol from molasses. The average production of molasses in East Africa during 2010 to 2013 is provided below:

Countries	**Molasses Production (MT)**
Kenya	140,000
Ethiopia	85,000
Uganda	71,000
Tanzania	62,000
Burundi	5,000
Rwanda	2,000

[7] https://cdn2.b2match.io/event/2901/assets/8478585412-9cc8c37a39.pdf, page 60

Total	**365,000**

Source: pg 130, Baseline Report of Clean Cooking Fuels in the East African Community, GAIA

Government of Kenya is also determined to augment the bio-ethanol production capacity by implementing long-term policy initiatives. The New Energy Bill 2015 released by Ministry of Energy is a good attempt to recognize the changing environment of energy regulation in Kenya and lay emphasis on developing renewable energy resources.
There is a widespread network of the micro-distilleries in the country which sell illegal alcohol in the local markets. Government has taken steps to curb illegal sale of alcohol and develop a support system for boosting bioethanol production in Kenya[8].

The renewable fuel to be utilized in this PoA will be centrally procured by the procurement partners of KOKO Networks. Then it would be distributed to all CPAs by the CME through KOKOpoints. The procurement partners may source fuel under long term arrangements with bio-ethanol producers. The fuel will be accepted for distribution to KOKOpoints after checking conformance on following parameters:

- Technical parameters of fuel quality as per international standards
- Fuel type ascertaining its renewable nature (Bioethanol will be exclusive fuel used in the PoA)

A.4. Coordinating/managing entity

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KOKO Networks Limited

A.5. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Kenya (Host Party)	KOKO Networks Limited	No

A.6. Public funding of PoA

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

SECTION B. Management system

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PoA Implementation & Management

This PoA is managed by KOKO Networks Limited (KOKO), a Private Limited Company registered in Kenya, as the Coordinating/Managing Entity (CME). The CME provides the necessary managerial, technical, legal, communication and administrative functions to operate and manage the PoA in accordance with the CDM requirements, including the process of inclusion of CPAs. In the cases where certain functions or tasks may be outsourced, the ultimate responsibility for final quality control and approval will remain with the CME.

The implementation of CPA will be managed by the CME alone or in coordination/partnership with local associates/agents. The CPA implementation includes procurement, distribution, installation and maintenance of cookstoves. The "KOKO Cooker" kit will be procured from outside Kenya. KOKO provides a digital platform to consumers by leveraging an agent network and existing infrastructure,

[8] Pg 100, Baseline Report of Clean Cooking Fuels in the East African Community by GAIA

such as partner petrol stations and local points of sale, to provide convenient and affordable access to cookstove kits and bio-ethanol fuel.

The key responsibilities of the PoA stakeholders are summarized in the below table:

CME: KOKO Networks Limited	CPA Implementer/Local Implementation Partner	Super Agents/KOKO Agents
• General Management and financing of the PoA and CPAs • Communications with the CDM EB, including on matters related to PoA/CPA inclusion, validation, verifications and emission reductions • Identification of Implementation partners • Management of operations under all CPAs within the PoA • Technical Review and Qualification of each CPA based on inclusion criteria • Assessment of technological and other aspects of the CPA and its integration with the PoA • Management of data and records related to PoA and all CPAs • Management of all legal compliances and adherence to best industry practices • Management of CDM Validation and verification functions • Management of Competence and training for CDM Monitoring • Implementation and assessment of CDM Management System	• Assisting CME in managing operations of the CPA in functions like sales, maintenance, Customer service and CDM monitoring of the CPA • Representing CME in events and activities relevant to the CPA • Ensuring compliance to any local policies or norms in consultation with the CME • Any other tasks & Responsibilities assigned by the CME	• Cooperate with CME/Local Partner in installation and commissioning of the KOKOPoints • Assisting Local Partner/CME in ensuring smooth operations of cookstove through reliable fuel supply and customer service for support and maintenance

Records & Documentation

The following records related to PoA management and CPA implementation will be maintained and archived electronically:

- Sales database for all cookstoves covered under CPAs implemented as part of PoA including all information essential for CDM monitoring and compliance
- Maintenance record of all cookstoves covered under CPAs implemented as part of PoA
- Aggregate Bio-ethanol fuel consumption data
- Documents and evidences related to CPA inclusion process
- Documents related to Annual Management Review Process for the PoA

CPA Inclusion Process

A CPA can be identified and proposed by the Investor/local partner/CPA Implementer or the CME itself by preparing the CPA-DD and other documents in line with the relevant generic CPA-DD of this PoA. In case, the proposer does not have adequate technical expertise, CME may facilitate the preparation of the CPA documents through in-house or outsourced consultancy services. The proposal of the CPA has to be submitted to the CDM Program Manager. The CDM Program Manager will conduct a thorough independent technical review to assess the feasibility of CPA design and its eligibility under the PoA as per the CPA inclusion criteria. The completed technical review report is submitted to the CEO of the CME. In case if all the eligibility requirements are met by the CPA, then the CEO may authorize the inclusion of CPA or may suggest further technical/non-technical review. In case, the CME is the proposer of the CPA, then the governing board of the CME may authorize the inclusion of CPA. Post authorization, the CDM program manager may either initiate the inclusion process by appointing a validation agency or directly submitting the completed documents on the UNFCCC website in accordance with the procedures defined in the CDM Project Cycle Procedures for Programme of Activities.

For the purpose of all CDM functions and responsibility, the CDM Program Manager will be provided adequate rights and authority through power of attorney to conduct impartial assessments and take independent decisions.

The key responsibilities of all stakeholders involved in the CPA inclusion process are summarized below:

Key Responsibilities of Stakeholders involved in the CPA Inclusion		
CPA Proposer	CDM Program Manager	Authorizer
• Identification of CPA • Formulating Design of CPA • Execute or Supervise preparation of CPA-DD and related documents • Taking Corrective Actions based on the technical review comments provided by the CDM program manager	• Conducting independent, impartial and objective technical review of the CPA eligibility under the PoA • Identifying potential conflict of interest situation arising in CPA inclusion process and taking appropriate remedial or mitigation steps • Ensuring appropriate communication of the CPA inclusion status to all stakeholders on time-to-time basis. • Managing authorization and registration of CPA inclusion with UNFCCC as per relevant CDM guidelines of eligible CPAs • Undertaking relevant trainings for effective execution of his/her duties and responsibilities like trainings related to CDM management system, CDM monitoring, quality control/quality assurance etc.	• Final authority for approval of CPA inclusion • Review of non-CDM aspects while authorizing the CPA inclusion

For the purpose of continual improvement, CME would conduct annual management review to review the performance of CDM management system, identify training requirements and review competencies.

CPA Implementation Process

The sale of "KOKO Cooker" cookstove kit under CPAs will take place only through online registration process (facilitated through the KOKOpoint tablet screen or myKOKO mobile application) wherein essential details of the household will be captured along with the execution of agreement on the transfer of rights of the emission reduction generated through the cookstoves. A consumer can complete the online registration through his mobile or can contact the nearby KOKO agent who will assist the consumer in completing the process. As the complete registration and payment is online, the complete details about the cookstove buyer will get logged into sales database automatically on real time basis. After purchase, the "KOKO Cooker" kit will be distributed to the consumer through KOKO Agents along with linking of digital chip-based smart canister with consumer's mobile number. Additional smart canisters can also be issued to the existing customer after completion of online registration and linking the canister with the registered mobile number.

The fuel to be utilized in this PoA will be centrally procured by the procurement partners of KOKO Networks. Then it would be distributed to all CPAs by the CME through KOKOpoints. The procurement partners may source fuel under long term arrangements with bio-ethanol producers. The fuel will be accepted for distribution to KOKOpoints after checking conformance on following parameters:

- Technical parameters of fuel quality as per national/international standards
- Fuel type ascertaining its renewable nature

Flow of CDM Information

The registration process will electronically capture following information about the consumer consistently across all CPAs:

- Household name and Mobile number
- Product model and serial number of KOKO Cooker and Canister(s)
- Date of installation/distribution
- Location of household (neighbourhood/address where purchased)
- Baseline Cookstove and its CDM status
- Type of use: household / SME

The registered information will be checked for any data discrepancy by the program manager on monthly basis and any identified error will be rectified through direct contact with the consumer.

The KOKO Agents are the first-line of customer service and are supported by KOKO's centralized customer support call centre. Customers can access their KOKO Cooker warrantee through dropping off Cookers with technical problems at the KOKO Agent, for reverse logistics by KOKO to the assembly facility for actioning then return to the customer. All processes are integrated into KOKO's digital platform, enabling real-time online tracking of the operations and maintenance activities of the cookstoves. In accordance with the confidentiality policy of the CME, the consumption and other details of an individual consumer will be kept confidential. However, the collective consumer behaviour like fuel consumption and other attributes will be available for CDM monitoring purpose as and when required.

Procedure to Avoid Double-Counting

CME has put in place adequate measures to avoid any double counting of emission reductions due to erroneous inclusion of existing CPA registered under other CDM project/PoA. The program manager reviews all the documents submitted for inclusion of a proposed CPA and confirms through desk review that the CPA is not part of any other CDM project/PoA operational in the same geographical area. Additionally, the CPA implementer is required to declare that the programme activity has not been and will not be registered either as a single CDM project activity or as a CPA under another PoA. (Refer Eligibility Criterion# 3 for CPA Inclusion)

Paragraph 166 of the PS for PoA requires that if the proposed CPA is implemented in the geographical location where more CDM projects/PoAs are also operating, the CPA implementer shall confirm that the proposed CPA will not lead to the discontinuation or modification of the former

project and does not decrease the GHG emission reductions or net anthropogenic GHG removals by the former project.

As per CME's analysis, the following are the cookstove projects registered in Kenya:

CDM Ref. No.	Registration project title	Project Type	Methodologies used at Registration	Project Fuel
5336	Efficient Cook Stove Programme: Kenya	PoA	AMS-II.G.	Woody Biomass
5341	Improved Cooking Stoves Programme of Activities in Africa	PoA	AMS-II.G.	Woody Biomass
7014	Improved Cook Stoves for East Africa (ICSEA)	PoA	AMS-I.E.; AMS-II.G.	Bioethanol
7997	BioLite Improved Cook stoves Programme	PoA	AMS-II.G.	Woody Biomass
8438	Clean Cook Stoves in Sub-Saharan Africa by ClimateCare Limited	PoA	AMS-II.G.	Woody Biomass
9265	Top Third Ventures Stove Programme	PoA	AMS-II.G.	Woody Biomass
9384	Kenya Improved woodstoves project	PoA	AMS-II.G.	Woody Biomass
10341	MicroEnergy Credits: Microfinance for Clean Energy Product Lines in Africa	PoA	AMS-II.G.; AMS-III.AR.; AMS-III.AV.	Woody Biomass
7359	PoA for the Reduction of emission from non-renewable fuel from cooking at household level	PoA	AMS-I.E.	Bioethanol

All the above CDM projects are distributing cookstove on cost basis with substantial capital investment for households. Due substantial cost of manufacturing, CME has kept the price of KOKO cooker at 69.99 USD (https://kokofuel.com/koko-cooker/). It is highly unlikely that if a consumer has purchased a cookstove under any other former CDM project, he will be able to purchase KOKO cooker. Thus, the substantial capital investment acts as a barrier and avoid discontinuation of former CDM project activity. However, CME has implemented robust measures to avoid discontinuation of other previously registered CDM projects at 2 levels. Firstly, at the time of distribution of cookstoves, the baseline appliance and its CDM status which the KOKO cooker is replacing will be recorded in the CME sales database. Secondly, at the time of periodic project monitoring through sampling and survey, the baseline appliance will be confirmed through physical inspection if the baseline appliance is still in use or covered under any other CDM project. The compliance of the PoA with the above requirement is discussed in section H.3 of generic CPA-DD below.

Training & Competence

The following types of training will be arranged by the CME for robust implementation of CPAs under the PoA:

- CDM monitoring and documentation training for CDM Team
- Cookstove repairing training for Cookstove Maintenance Team

For the above training types, group training sessions will be conducted by a qualified trainer. Alternatively, study material may also be provided to the team members for self-study. CME will maintain the documentation for each of such trainings in accordance with the CDM requirements.

Continual Improvement

An annual management review meeting will be conducted to assess the overall performance, review the competencies and document control process of all CPAs under the PoA viz-viz compliance with applicable CDM requirements.

SECTION C. Demonstration of additionality of PoA

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The additionality of the PoA is being demonstrated using the Tool 19: Demonstration of additionality of microscale project activities, Version 08.0. Para 8(c) of the Tool specifies the following:

"The project activity is designed for distributed energy generation (not connected to a national or regional grid) 12 with both conditions (i) and (ii) satisfied;

i. *Each of the independent subsystems/measures in the project activity is smaller than or equal to 1500 kW electrical installed capacity;*
ii. *End users of the subsystems or measures are households/communities/small and medium enterprises (SMEs)"*

The "KOKO Cooker" kit has a rated thermal output of 2.1 x 2 kW. Hence, the rated output capacity is smaller than 1500 kW thereby complying to requirement (i). The cookstoves will be distributed to households and institutions falling in the SME category. The above requirement has been developed as an eligibility criterion for inclusion of CPA in the PoA to ensure that the CPAs under the PoA remain additional throughout the lifetime of the PoA.

SECTION D. Start date and duration of PoA

D.1. Start date of PoA

>>
16/01/2019 (Publication of PoA-DD for Global Stakeholder Consultation marking start of validation of the PoA)

D.2. Duration of PoA

>>
28 years

SECTION E. Environmental impacts

E.1. Level at which environmental impacts analysis is undertaken

>>
Environmental analysis is undertaken at PoA level.

E.2. Analysis of environmental impacts

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An environmental analysis study is conducted by the CME to identify adverse impacts of distribution of cookstoves at PoA level. The "KOKO Cooker" kit complies with all the safety norms of the country and uses bio-ethanol fuel which is a renewable fuel and does not emit any toxic or harmful waste during its operation. Therefore, it is reasonable to consider that the implementation of PoA will not lead to any adverse environmental impact. Hence, no further environmental analysis will be required at CPA level.

E.3. Environmental impact assessment

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Not Applicable

The implementation of PoA, involving distribution of bio-ethanol cookstoves, does not fall under the 15 sectors identified for mandatory requirement of Environmental Impact Assessment[9] (EIA) by the National Environment Management Authority, Kenya (NEMA). Hence, a detailed EIA report is not mandatory for the implementation of PoA.

SECTION F. Local stakeholder consultation

F.1. Level at which local stakeholder consultation is undertaken

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The local stakeholder consultation is conducted at PoA Level.

F.2. Modalities for local stakeholder consultation

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The local stakeholder consultation meeting was held by the CME on 20th December 2018.

a) The scope of Local Stakeholder Consultation

The scope of local stakeholder consultation was to discuss and invite feedback on the direct indirect positive or negative impacts of the PoA. There are no specific host party rules for conducting stakeholder consultation.

b) The minimum group of stakeholders involved

Various group of stakeholders were invited including the following:

- Representatives of local, county and national government agencies relevant to the project
- Kenyan citizens impacted by the project or official representatives
- Kenyan and international non-governmental organizations (NGOs) working on topics relevant to your project
- The local DNA representative

The aforesaid constitute the stakeholders that are deemed directly / indirectly impacted by the PoA.

c) Means of inviting stakeholders' participation

Various means of communication were used for inviting stakeholders.

- Notice were published in local newspapers alerting stakeholders about the consultation for the PoA, encouraging them to participate and share comments and feedback during the physical meeting on 20/12/2018
- Email invitations were sent to various stakeholders asking them to participate in the physical meeting.
- Letters were also sent to various stakeholders inviting them to the physical meeting to share their feedback and concerns
- Phone based invitations were also sent to specific distinguished stakeholders

A non-technical summary of the PoA and a feedback form (questionnaire) were also shared on the company website to receive comments and feedback from stakeholders who are not able to attend the meeting.

d) The information made available to stakeholders

A non-technical summary of the PoA was made available to the stakeholders to make them understand the PoA with ease. The non-technical summary was circulated in English, which is spoken by all Kenyan stakeholders. The non-technical summary included a brief description and scope of project activity along with its impacts on various environmental, socio economic and technological issues.

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9 https://www.nema.go.ke/index.php?option=com_content&view=article&id=119&Itemid=144

e) The conduct of consultation

During the physical meeting on 20 Dec 2018 at Nairobi, Kenya, the stakeholders present were explained about the PoA via a presentation. The non-technical summary was explained and the impacts of the PoA were discussed. During the meeting, the questions raised by stakeholders were answered and the proceedings were recorded.

F.3. Summary of comments received

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The attendees of the local stakeholder consultation meeting actively participated in the meeting. During the questions & answers session, stakeholders raised questions related to following aspects of the PoA:

Question	CME Response
1. Implementation Timelines and Selection of counties for cookstove distribution	The full Network launch, and the delivery of the early orders, will be in May 2019. The towns highlighted in the presentation are part of the current planning process, which has not yet mapped the entirety of Kenya. We do however intend to build a country-wide clean fuel distribution network.
2. Features & Affordability of bio-ethanol cookstoves	We will be launching with the 2-burner only. We have piloted a 1-burner too, but the clear feedback we have received is that the majority of customers prefer the 2-burner option, so long as it is affordable. It is possible that we will offer a 1-burner in future. KOKO's customers are able to buy the KOKO Cooker with cash upfront, or access the KOKO savings program, enabling them to make "layby" payments over time, and collect their stove on completion of those payments. This program has proven very successful with lower-income customers during the Soft Launch, and enables the cashflow barrier of the upfront price to be effectively removed.
3. Fuel Prices and fuel consumption details	In our 'Soft Launch' phase over the last 18 months, the fuel has been retailed at 85 KSh. Per litre, inclusive of all taxes. We want to work with the Government of Kenya to reduce that price as much as possible through example removal of VAT. The fuel consumption depends on a number of variables, such as household size and cooking habits, but we currently estimate that a full 2.4 litre Canister would last an average household of four, cooking two meals a day, about 5 days.
4. Exposure and know-how to use the digital technology (KOKO Points) for purchase and collection of bio-ethanol fuel	We believe that the basic fuel purchase and stove use part of our model is very intuitive and straightforward, and we have invested in educational videos that display on the KOKOpoint to help new customers to understand the process of opening an account, buying a stove, and refilling their canister. This has been working well in a variety of Nairobi neighbourhoods for the last 18 months.

5. Safety of the fuel-filling stations and the cookstoves	Safety is our first priority. On the Cooker itself, there is a mechanism to prevent over-filling, while the burners cannot be turned on if the fuel Canister is docked. In terms of lighting the Cooker, we have worked hard to ensure it is easy-to-light, but also very safe, and customers need to very deliberately insert a match into the Cooker to light it. This means that there is not the danger of accidental lighting – and of course there is no release of flammable gas either – a unlit burner can be left in the "on" position with no negative safety impact, and no risk of explosion. The reusable fuel Canister (equipped with a vapor-tight smart valve) also plays an important role, since it is the only way to get fuel from the KOKOpoint to the Cooker. This means that there is no way customers can pour ethanol onto a charcoal stove, for example, or attempt to drink the ethanol. (It is also worth noting that, by Government of Kenya regulation, all ethanol for cooking used in Kenya is denatured at source or port with a chemical called Bitrex, which renders the fuel undrinkable and induces vomiting if swallowed.) Finally, on the KOKOpoint fuel dispenser, these are fitted with a range of sensors which feed back real-time information to our teams in real-time, so that any technical issue is immediately understood and dealt with. The interior fuel tank is stainless steel and has been certified by SGS to withstand the pressure build-up associated with an external fire in the shop, and our technology has been assessed by the HSEQ teams at major oil companies. Our goal is to improve the safety reality at our Agent shops through the presence of a KOKOpoint, which we achieve through real-time monitoring of heat, smoke, vapour and the installation of a fire extinguisher.
6. Suitability of Cookstoves for large families and cooking traditional Kenyan Food	Our research team has conducted a huge number of focus groups and trials, and this has informed each iteration of our Cooker. We were very keen to create a solution that was both sturdy and strong (to take those large pots), but also light enough to be portable. We are comfortable that the KOKO Cooker achieves this outcome. The cookstove has been successfully tested at our office premises for preparing traditional Kenyan food like ugali for more than 50 staff members on regular basis.
7. How can the interested parties can associate with KOKO for enabling cookstoves and fuel distribution?	The primary way people can partner with KOKO is by becoming an Agent. For agent evaluation, we have developed an in-house scoring system that includes factors such as the store location, proximity to target neighbourhoods, shop size

	and type, operating history, credit record, physical security, accessibility for MicroTankers and accessible space for a KOKOpoint. In parallel, we are also working with individual businesses to provide an appealing offering to their employee base. We expect that this B2B approach will play an important role in the success of the programme. Individuals also have the opportunity to earn income through our customer referral programme. Apart from direct agents, we are also exploring potential "Super-Agent" distribution partnerships for cities and towns outside Nairobi. As we expand beyond Nairobi, our marketing team will be very keen to discuss stove distribution plans with interested parties who can reach a large number of individuals or groups.

The overall feedback for the PoA was appreciative and multiple benefits of implementing the PoA were identified by the stakeholders. No complaints were received from the stakeholders during the meeting.

F.4. Consideration of comments received

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No complaints were received by the stakeholders with regard to the PoA. The open consultation process running on the company website closed on 01/01/2019. No negative comments or complaints were received. CME will be open to receive comments during the PoA implementation and will take appropriate actions to address any stakeholder concern if raised through proper channels.

SECTION G. Approval and authorization

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CME has received the host country approval and authorization letter date 12/04/2019 (Ref. No. NEMA/10/3/VOL.XII) from National Environment Management Authority which is the DNA of Kenya.

PART II. Generic component project activity (CPA)

SECTION H. Description of generic CPA

H.1. Title of generic CPA

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CPA-00xx: KOKO Kenya - Ethanol Cookstoves Program

H.2. Reference number of generic CPA

>>
Generic CPA#0001

H.3. Purpose and general description of generic CPA

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The CPA involves distribution of bio-ethanol fuel cookstoves and promote its use for cooking purposes in households and institutions falling in the SME category in Kenya. The consumers for cookstoves may include, inter alia, households, restaurants, commercial food outlets.

KOKO will enable distribution of high efficiency bio-ethanol cookstoves and last-mile delivery of bio-ethanol fuel to the target customers using cloud systems and internet-of-things (IoT) technology to allow low cost affordable access to clean fuel.

The PoA would rely heavily on carbon financing for its implementation and expansion. Each CPA will be developed with support from a Korean investor who will finance all the implementation costs of the CPA. CPA1 has been financed by ECOEYE Co., Ltd. and CPA2 financed by Pine Tree Carbon LLC. The funds from Korean investors enable households to access KOKO Cooker Kits at a subsidised price which is critical to make them affordable. The funds also support the operation & maintenance expenses of the bioethanol cookstove supply chain to enable each CPA to operate in a financially sustainable condition.

The CPA involves displacement of woody biomass by renewable fuel which falls in Type 1 GHG mitigation measure. In accordance with the Micro-scale Additionality Tool, the rated capacity of the individual cookstove will be less than threshold limit defined for "microscale CDM units" i.e. 1500 kW. Hence the CPA will be exempted from microscale aggregate threshold and bundling requirements.

In accordance with the applied methodology, the baseline scenario, in the absence of the project activity, would be the use of fossil fuels for meeting similar thermal energy needs. The Second National Communication to UNFCCC states:

"About 87 per cent of the country's domestic energy demand is met by biomass particularly wood fuel, which provides 90 per cent and 85 per cent of rural and urban households' energy requirement, respectively. The need for wood has led to substantial deforestation and land degradation. Access to modern energy services is required to reduce the wood fuel dependency."

In absence of implementation of the proposed CPA, the households would have continued to use unimproved cookstoves consuming woody biomass, consisting of firewood and charcoal, for cooking purpose which is also the existing pre-project scenario.

Impact on other registered CDM projects in the same geographical area

Paragraph 166 of the PS for PoA requires that if the proposed CPA is implemented in the geographical location where more CDM projects/PoAs are also operating, the CPA implementer shall confirm that the proposed CPA will not lead to the discontinuation or modification of the former project and does not decrease the GHG emission reductions or net anthropogenic GHG removals by the former project.

As per CME's analysis, the following are the cookstove projects registered in Kenya:

CDM Ref. No.	Registration project title	Project Type	Methodologies used at Registration	Project Fuel
5336	Efficient Cook Stove Programme: Kenya	PoA	AMS-II.G.	Woody Biomass
5341	Improved Cooking Stoves Programme of Activities in Africa	PoA	AMS-II.G.	Woody Biomass
7014	Improved Cook Stoves for East Africa (ICSEA)	PoA	AMS-I.E.; AMS-II.G.	Woody Biomass
7997	BioLite Improved Cook stoves Programme	PoA	AMS-II.G.	Woody Biomass

CDM Ref. No.	Registration project title	Project Type	Methodologies used at Registration	Project Fuel
8438	Clean Cook Stoves in Sub-Saharan Africa by ClimateCare Limited	PoA	AMS-II.G.	Woody Biomass
9265	Top Third Ventures Stove Programme	PoA	AMS-II.G.	Woody Biomass
9384	Kenya Improved woodstoves project	PoA	AMS-II.G.	Woody Biomass
10341	MicroEnergy Credits: Microfinance for Clean Energy Product Lines in Africa	PoA	AMS-II.G.; AMS-III.AR.; AMS-III.AV.	Woody Biomass
7359	PoA for the Reduction of emission from non-renewable fuel from cooking at household level	PoA	AMS-I.E.	Bioethanol

If the proposed CPA is implemented in the geographical location where more CDM projects/PoAs are also operating, the CPA implementer will declare that the proposed CPA will not lead to the discontinuation or modification of the former project and does not decrease the GHG emission reductions or net anthropogenic GHG removals by the former project

All the above CDM projects are distributing cookstove on cost basis with substantial capital investment for households. Due substantial cost of manufacturing, CME has kept the price of KOKO cooker at 69.99 USD (https://kokofuel.com/koko-cooker/). It is highly unlikely that if a consumer has purchased a cookstove under any other former CDM project, he will be able to purchase KOKO cooker. Thus, the substantial capital investment acts as a barrier and avoid discontinuation of former CDM project activity. However, CME has implemented robust measures to avoid discontinuation of other previously registered CDM projects at 2 levels. Firstly, at the time of distribution of cookstoves, the baseline appliance which the KOKO cooker is replacing will be recorded in the CME sales database and it will be confirmed, if improved cookstove is identified, that the baseline appliance is not a part of other CDM registered project. Secondly, at the time of periodic project monitoring through sampling and survey, it will be confirmed through physical inspection that the baseline appliance is not part of other CDM project, if the baseline appliance is still in use.

H.4. Technologies/measures

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KOKO's clean fuel technology, "KOKO Cooker" stove kit consists of a two-burner stove and a durable 'smart' canister equipped with an NFC chip that enables tracking of customer fuel purchases. To create affordable and reliable access to bio-ethanol as clean cooking fuel, KOKO has developed first-of-its-kind technology to lower distribution costs by launching a network of cloud-connected "KOKOpoint" fuel ATMs across Kenya, which enable customers to refill their smart canisters in local retail corner stores. Customers can buy their KOKO Cookers through ordering on the KOKOpoint tablet screen, via the myKOKO mobile app, or from a network of field sales promoters. Customers can also take advantage of the savings scheme launched on the KOKO platform, which enables low-income customers who have difficulty with the upfront cost of the KOKO Cooker to make progressive payments towards their stove.

The technology will result in displacement of high GHG-emitting woody biomass as cooking fuel in the low-income households and commercial spaces of Kenya. In absence of implementation of the proposed CPA, the households would have continued to use unimproved cookstoves consuming woody biomass, consisting of firewood and charcoal, for cooking purpose which is also the existing pre-project scenario.

The procurement of the cookstoves for the PoA will comply with the national regulation on ethanol cookstoves – "Ethanol Fuelled Cooking Appliances Specfications"[10]. As an illustration, the "KOKO Cooker" stove kit consisting of a two-burner stove and a durable 'smart' canister, with thermal efficiency of 60% and thermal output of 2.1 kW (against the requirement of 45% efficiency and 1.4 kW output) fully comply with the above standard. The detailed specification are as follows:

Description	2-burner Bio-ethanol stove for domestic cooking purposes
Fuel Denatured	Bio-ethanol Cooking Fuel (95% ethyl alcohol, 5% water; 22 MJ/kg lower heating value)
Firepower	2100 Watts on MAX flame setting; 1000 Watts on MEDIUM; 500 Watts on LOW
Overall Efficiency	60% (energy content of fuel transferred to contents of pot; as defined by ISO WBT methodology)
Fuel Capacity	2.4 Litres fuel capacity within stove
Burn Time	2.5 hours per burner on MAX setting (5 hours per burner on LOW setting) for fully fuelled stove
Expected Service Life	10 years with routine annual maintenance
Box Dimensions	90 cm (width) x 33 cm (depth) x 20 cm (height) ; with carry handle Box Weight (gross) 8 kg

The CME will ensure that the thermal output of each cookstove distributed under the PoA shall not be higher than 1500 kW. Hence, all cookstoves under the PoA will qualify as "CDM micro unit" thereby demonstrating the additionality of PoA. The average lifetime of the bio-ethanol cookstoves is 10 years and will be operational during the entire crediting period of the CPA.

SECTION I. Application of methodologies and standardized baselines

I.1. References to methodologies and standardized baselines

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Approved small scale methodology AMS-I.E 'Switch from non-renewable biomass for thermal application by the user' version 09.0
http://cdm.unfccc.int/methodologies/DB/IO5FJLJFWT91R6B8SO5BC7TXSK27I2

Reference Tools & Methodology:

- Tool 19: Demonstration of additionality of microscale project activities, Version 08.0
- Tool 30: Calculation of the fraction of non-renewable biomass, Version 1.0

I.2. Applicability of methodologies and standardized baselines

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Applicability Condition of AMS-I.E	Justification
1. This methodology comprises of activities to displace the use of non-renewable biomass by introducing renewable energy technologies. Examples of these technologies include, but are not	The CPA involves distribution of bio-ethanol stoves for cooking. Bioethanol in Kenya and other East African countries is manufactured from molasses which is an agro-waste residue and hence is classified as renewable source. As discussed in section A.3 above, Kenya is largest producer of sugarcane and hence enjoys

10 Kenya Standard: Ethanol fueled cooking appliances – Specification (KS 2759:2018 – ICS 97.040.20)

limited to biogas stoves, bio-ethanol stoves, solar cookers, passive solar homes	abundant availability of molasses which is resulting in large quantity of molasses-based bioethanol being exported to other countries. About 93% of ethanol is produced from renewable sources owing to better economic feasibility[11]. Since the smart cookers technology is solely dependent on the dedicated fuel supply through KOKOpoints (no external fuel filling possible due to proprietary valve system), they will only operate on bioethanol which will be centrally procured by the CME through a framework agreement with a major Fuel Marketing Company (FMC) [12] . The fuel protocol as part of framework agreement prohibits the procurement of synthetic ethanol for this PoA. The trader/FMC supplying the fuel will submit a renewability statement declaring that the fuel supplied to the FMC and the CME customers is sourced from renewable feedstock. The process will ensure that only renewable bioethanol is consumed in the PoA. The renewability certificate from the trader/FMC will be available for the verification purpose. Additionally, in accordance with the framework agreement, an independent analyst is collaboratively hired by CME and FMC, to test the product , on sample basis, against the supplier's Certificate of Quality (CoQ) for conformance. The fuel will be approved for further distribution only if the fuel conforms to the standards as defined in the "Bioethanol Product specification" document. The implementation of project activity will result in displacement of non-renewable fossil fuel by renewable bio-ethanol fuel in households and SMEs in Kenya.
2. Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics	In 1980, 95% of total non-commercial energy demand in Kenya was met through fuelwood and charcoal[13]. There has not been significant change in the non-commercial energy scenario since 1980 and the majority of household energy demand was met through charcoal and fuelwood even in year 2017 in Kenya. According the baseline analysis of the National Climate Change Action Plan 2013-2017 and Second National Communication to UNFCCC, the LULUCF sector is the second largest contributor to Kenya's GHG emissions after agriculture, accounting for 32.5% of

[11] http://www.essentialchemicalindustry.org/chemicals/ethanol.html

[12] https://www.vivoenergy.com/About/Vivo-Energy-at-a-glance

[13] Energy and Development in Kenya – Opportunities & Constraints, The Beijing Institute & The Royal Swedish Academy of Sciences Stockholm, Sweden

	emissions in 2015 largely as a result of deforestation through clearing of forested lands for agriculture, wood harvesting, for fuelwood, charcoal and other wood products and urban development or settlement. It can therefore be concluded that non-renewable biomass has been used in Kenya since long back before 31st December 1989.
3. The methodology is applicable for technologies displacing use of non-renewable biomass by renewable energy	The technologies implemented under this CPA will be energy efficient cook stoves that use bio-ethanol fuel from molasses, which is a renewable biomass and will displace the use of fuel wood, which is a non-renewable biomass used by the baseline stoves.
4. Project participants or coordinating and managing entities shall describe in the PDD/PoA-DD how the double counting of emission reductions has been addressed (e.g. between end users, distributors and producers of stoves)	All the activities starting from production to distribution to operation of KOKO smart cookers is being centrally managed by the CME through a digital platform connected to all users via mobile network. Each smart cooker will be tagged by a unique identification number which will be linked to the NFC chip attached to the smart cooker. This technology is exclusive to KOKO smart cookers and not available to previously registered CDM projects. Hence, there is no possibility of double counting of the cookstoves. Any double counting due to discontinuation of existing CDM project is also addressed through a robust management system which is discussed in section H.3 above.
5. For project activities introducing bioethanol cookstoves project participants or coordinating and managing entities shall demonstrate that the bioethanol cookstoves are designed, constructed and operated to the requirements (e.g. with regard to safety) of a relevant national or local standard or comparable literature. Latest guidelines issued by a relevant national authority or an international organisation may also be used.	The KOKO Cookstoves, to be distributed under the CPA, are designed and constructed in accordance with the national safety and performance regulation on ethanol cookstoves of Kenya – "Ethanol Fuelled Cooking Appliances Specifications" [14] . As an illustration, the "KOKO Cooker" stove kit consisting of a two-burner stove and a durable 'smart' canister, with thermal efficiency of 60% and thermal output of 2.1 kW (against the requirement of 45% efficiency and 1.4 kW output) fully comply with the above standard.

I.3. Application of multiple methodologies

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Not Applicable

I.4. Project boundary, sources and greenhouse gases (GHGs)

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Kenya Standard: Ethanol fueled cooking appliances – Specification (KS 2759:2018 – ICS 97.040.20)

As per paragraph 12 of the applied methodology, the project boundary is the physical, geographical site of the use of biomass or the renewable energy. In the project activity, the project boundary becomes the place of operation of the cookstoves distributed under CPAs implemented as part of the PoA.

Source		GHG	Included?	Justification/Explanation
Baseline	Combustion of Non-renewable biomass/fossil fuel for cooking in households and SMEs	CO_2	YES	Main Source of emissions
		CH_4	NO	Not required by the Methodology
		N_2O	NO	Not required by the Methodology
Project activity	Combustion of non-renewable bio-mass/fossil fuel for cooking in households and SMEs	CO_2	YES	Main Source of emissions
		CH_4	NO	Not required by the Methodology
		CO_2	Yes	Adjustment factor included in the baseline emission calculation
		N_2O	No	Not required by the methodology
	Energy Consumption associated with Production of Feedstock or renewable fuel and its distribution	CO_2	Yes	Minor source of emissions
		CH_4	No	Not Applicable
		N_2O	No	Not Applicable

I.5. Establishment and description of baseline scenario

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As per the applied methodology, the baseline scenario, in the absence of the project activity, would be the use of fossil fuels for meeting similar thermal energy needs.

Kenya, primarily being a low-income country, historically has high dependence on biomass fuel for total energy use. More than 2/3rd of the total energy requirement is met by the biomass fuel in Kenya. For household energy purpose, the dependency on biomass fuel is even higher as described below in table 1.

The Second National Communication to UNFCCC states:

"About 87 per cent of the country's domestic energy demand is met by biomass particularly wood fuel, which provides 90 per cent and 85 per cent of rural and urban households' energy requirement, respectively. The need for wood has led to substantial deforestation and land degradation. Access to modern energy services is required to reduce the wood fuel dependency."

This is further corroborated by the National Economic Survey 2018 report which states that around 88% of total household energy demand is met by fuelwood consumption in Kenya (refer Table 1 below).

Table 1: Household Energy Consumption by Energy Source

Fuel-Type	HH Energy Consumption (TJ) [2]	Percentage Distribution of Energy Consumption
Firewood	723,891.85	87.71%
Charcoal	62,286.33	7.55%
Kerosene	1,474.02	0.18%
LPG	858.45	0.10%
Electricity	10,504.56	1.27%
Renewable Biomass	26,347.71	3.19%

Total	**825,362.92**	**1.00**

Source: National Economic Survey 2018, Kenya

Since economic liberalization in 1993, Kenya is enjoying a positive growth rate albeit fluctuating in magnitude. However, access and penetration of modern and clean fuel for household energy use has still been a challenge in Kenya. In last 2 decades, the use of charcoal has increased in Kenya due to many factors like convenience and migration. The production of charcoal from wood is highly inefficient and is often harvested illegally, leading to massive scale deforestation in Kenya. Over 95% of the kilns used in the country are considered inefficient, with conversion efficiencies in the range of just 8-20%.

In recent years, the Govt. of Kenya has taken cognizance of the inefficiencies in household energy sector and taking steps to mainstream modern clean fuels like LPG. However, it is facing daunting challenge in significantly altering the consumption pattern due to various reasons despite having significant health, environmental and economic benefits. Few of these reasons are lack of consumer awareness, affordability and accessibility barriers associated with LPG.

Due to low penetration of LPG, the majority of households are still using traditional cookstoves which are highly inefficient and unhealthy. As a result, Kenya loses 10.3 million m 3 of wood from its forests every year from firewood and charcoal consumption, a major contributor to the country's 0.3% annual deforestation rate[15].

Apart from Household consumption, the consumption of fuelwood and charcoal is rampant in cottage industries (SMEs) in Kenya. In fact, Food kiosks and restaurant consumes the majority share (more than 70%) of the total woody biomass consumption in cottage industries. Due to high energy prices and low-income levels in households, there is a vast network of unorganized food kiosks in Kenya. These informal food kiosks play a vital role in offering easy access to affordable food[16]. Many households are not able to afford purchase of charcoal or firewood to cook for themselves due to high poverty penalty imposed on small quantities of fuel, vegetables and meat.
In a recent study undertaken by Akiba Mashinani (2016) in Mukuru – one of the informal settlements in Nairobi with only 30 villages, the 101,076 households in the area cumulatively spent Ksh 4.2 billion in a year on food, provided through these informal food networks[17].

Analysis of the fuel types by SMEs (businesses and institutions) shows that the most popular fuel types in terms of their various uses are; charcoal (81%), followed by gas (34%), firewood (21%), electricity (9%), kerosene (3%) in that order. In the case of fuel wood, schools consumed the highest amount while hospitals preferred gas in their fuel use. Charcoal was largely used in restaurants and kiosks reflecting the importance of biomass energy in supplying energy in commercial enterprises[18]. Findings also show that the fuels in this market segment are largely used for cooking (91%), followed by barbecue (11%), space heating (6%), autoclaving (2%) and warming water (1%).

Therefore, the heavy dependence of households and SMEs (businesses and institutions) over woody biomass (fuelwood and charcoal) is evident and establishes woody biomass as the baseline fuel for cooking purpose within Kenya.

15

"Scaling up clean cooking in urban Kenya with LPG & Bio-ethanol" by Dalberg

16 https://www.newsdeeply.com/womensadvancement/articles/2018/10/04/women-run-kadogo-food-stalls-ensure-the-poor-are-fed-in-nairobi-slums

17 https://routetofood.org/food-justice-in-urban-informal-settlements/

18 Pg 36 & pg 70, Biomass Fuel Market Study, Africa Turnaround Limited

Realizing the current cooking fuel market challenges, KOKO has taken initiative to make bio-ethanol, a modern clean renewable fuel, an attractive cooking fuel alternative by developing an innovative digital platform to drastically lower the fuel delivery cost. To streamline the supply chain for bioethanol, KOKO has partnered with Fuel Marketing Company (FMC) which will procure bioethanol from reliable bioethanol producers to ensure sustainable bioethanol supply. As the FMCs have strong supply chain network and storage infrastructure, the same will be used for supply of bioethanol to provinces in Kenya. Once approved by KOKO for distribution, the renewable bioethanol will be delivered to all KOKOpoints through its smart logistics distribution network ready for refilling of canisters by the end-users.

LPG is well understood as fuel and enjoys more visibility and promotion by the Govt. of Kenya thereby resulting in relatively high adoption rate in higher income customer segments. On the basis of inhouse research and owing to its significant health and operational cost benefits viz-a-viz traditional fuels, bio-ethanol cooking fuel is positioned as an attractive alternative for low to lower-middle income communities to replace dirty traditional fuels like charcoal and fuelwood. Hence, it is most likely that the project activity will result in displacement of traditional biomass fuels.

The Kenyan power sector policies and regulations

The power sector falls under the Ministry of Energy (MoE) and is regulated by the Energy Regulatory Commission (ERC). The latter regulates the entire energy sector and is empowered to set, review and adjust tariffs for sale and to ensure competition in the power sub-sector.

The energy policies and regulations of Kenya relevant to this PoA are given below:

- The Energy Act 2006: National policy and strategy document for short to long-term energy development in Kenya
- Feed-in Tariff Policy 2008: Development of electricity generation projects from renewable sources
- The Energy (Energy Management) Regulations 2012: Promotion of Energy Management and Conservation in Kenya
- The Energy Bill 2017: National Integrated Energy Policy

None of the above policies give any type of comparative advantage to a particular technology or fuel and hence cannot be classified as E+ or E- policy.

I.6. Estimation of emission reductions

I.6.1. Explanation of methodological choices

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Baseline Emissions

Baseline emissions will be calculated using equation (1) provided in paragraph 20 of the applied methodology.

$$BE_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected} \quad \text{Equation (1)}$$

Where:

BE_y	=	Baseline emissions during the year *y* in t CO_2e
B_y	=	Quantity of woody biomass that is substituted or displaced in tonnes
$f_{NRB,y}$	=	Fraction of woody biomass used in the absence of the project activity in year *y* that can be established as non-renewable biomass (fNRB)
$NCV_{biomass}$	=	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne)

$EF_{projected_{fossil}fuel}$ = Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 63.7 t CO_2/TJ[19]

The following variables will be fixed ex ante for emission reduction calculations during the crediting period:

i) Fraction of woody biomass used in the absence of the project activity in year *y* that can be established as non-renewable biomass (fNRB)
ii) Net calorific value of the non-renewable woody biomass that is substituted
iii) Emission factor for the substitution of non-renewable woody biomass by similar consumers.

B_y, quantity of woody biomass that is displaced, will be monitored ex post in accordance with paragraph 21 of the applied methodology. For cookstoves operational in households, Option (b) is applied to calculate parameter B_y as the product of the number of persons served per household multiplied by the number of households and the estimate of average annual consumption of woody biomass per person that is displaced by the project activity.

$$B_y = \sum_{1}^{i} N_{HH} \times N_{p,HH} \times \left(BC_{BL,PP,y} - BC_{PJ,PP,y}\right) \quad \text{Equation (2)}$$

Where:

N_{HH} = Number of households in the project activity, number
$N_{p,HH}$ = Average number of persons served per household, number
$BC_{BL,PP,y}$ = Average annual consumption of woody biomass per person before the start of the project activity, tonnes/person/year
$BC_{PJ,PP,y}$ = If it is found that pre-project devices were not completely displaced but continue to be used to some extent, average annual consumption of woody biomass per person in the pre-project devices during the project activity, tonnes/person/year

SME Baseline Emissions

For cookstoves operational in SMEs, Option (d) is applied to calculate parameter B_y on the basis of bioethanol consumed in the SME.

$$B_y = \sum_{i}^{n} HG_{p,y} \div \left(NCV_{biomass} \times \eta_{old,i}\right) \quad \text{Equation (3)}$$

Where:

$HG_{p,y}$ = Quantity of thermal energy generated by the new renewable energy technology in the project in year *y* (TJ)
$\eta_{old,i}$ = Efficiency of pre - project device per type of device *i*

General Discussion on Project Boundary and associated Project Emissions in AMS-I.E.

The Project Boundary identified by AMS.I.E. version 9 is:
"The project boundary is the physical, geographical site of the use of biomass or the renewable energy."

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19 This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. The value is calculated, based on the global average ratio of cooking fuels (the normalized ratio of kerosene and liquefied petroleum gas (LPG) excluding coal), i.e. 9 per cent for kerosene (71.5 t CO2/TJ) and 91 per cent for LPG (63.0 t CO2/TJ).

The Project Emissions section in applied methodology AMS-I.E. states:
"The project emissions (Ey) from cultivation, use and processing of biomass shall be calculated using the latest version of "TOOL16: Project and leakage emissions from biomass". In doing so, the following sources of project emissions shall be considered as applicable, bearing in mind that some sources may be only relevant for specific fuels (e.g. production of bioethanol):
(a) CO2 emissions from on-site consumption of fossil fuels due to the project activity, calculated using the latest version of "TOOL03: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", including the consumption of fossil fuels for any processing of feedstock;
(b) CO2 emissions from electricity consumption by the project activity using the latest version of "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", including the consumption of electricity for any processing of feedstock;
(c) Methane emission from solid waste disposal or waste water calculated as per provisions in AMS-III.G. (landfill); AMS-III.F. (composting) and AMS-III.H. (waste water treatment) in cases where the waste is disposed in anaerobic conditions;
(d) Project emissions related to cultivation of feedstock are calculated using the latest version of the tool "TOOL16: Project and leakage emissions from biomass";
(e) Project emissions from transportation are estimated using the latest version of the tool "TOOL12: Project and leakage emissions from transportation of freight," if the transportation distance is more than 200 km; otherwise they can be neglected."

While developing the PoA-DD, CME realised that all the emissions sources identified by the applied methodology in "Project Emissions" section do not fall within the project boundary as prescribed by the methodology. Hence, to further understand the fundamental requirement of AMS-I.E, other similar methodologies – AMS.I.I and AMS.I.C were referred.

AMS-I.I – "Biogas/biomass thermal applications for households/small users"

Project Boundary: AMS-I.I. identifies project boundary as the physical, geographical sites of the equipment producing thermal energy during the crediting period. This essentially means project boundary comprises of the geographical site where the biomass is being consumed for thermal energy purposes. There is in-principle conformance of the project boundary of AMS-I.I. with the methodology AMS-I.E.
Project Emissions: The only project emissions considered by the methodology is the fossil fuel consumption at the geographical site where biomass is consumed. The identified project emissions are in accordance with the prescribed project boundary of the methodology.

AMS-I.C – "Thermal energy production with or without electricity"

Project Boundary: AMS-I.C. identifies project boundary (relevant to a cookstove distribution project) as:

(a) All plants thermal energy located at the project site, whether fired with biomass, fossil fuels or a combination of both;
(b) Industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment affected by the project activity;
(c) The processing plant of biomass residues, for project activities using solid biomass fuel (e.g. briquette), unless all associated emissions are accounted for as leakage emissions or are part of an independently registered CDM project;
(d) The transportation itineraries, if the biomass is transported over distances greater than 200 kilometres, unless all associated emissions are accounted for as leakage emissions;

Project Emissions: AMS-I.C. identifies 2 more source of emissions i.e. processing of biomass for project activities using solid biomass and transportation of biomass. However, the methodology also provides option to consider the emission sources under leakage. Hence, the identified project emissions are in accordance with the prescribed project boundary of the methodology.

The analysis of above methodology helped CME in developing better understanding about the fundamental requirements of methodologies approved for thermal power projects, specifically the applied methodology AMS-I.E, which are as follows:

- The core element of project boundary is geographical site of biomass utilization in all methodologies approved for thermal power projects.

- There may be certain projects, where processing of solid biomass (like briquettes) is also a part of project activity and performed specifically for the utilization of biomass by the project activity. In such scenarios, the associated emissions shall also be considered as project emissions.
- All the other emissions which are attributable to the project activity like transport, shall be discussed as project emissions if they are part of the project activity. Otherwise they shall be discussed under leakage emissions.

In this PoA, due to distributive nature of the project, the Geographical site of biomass (bioethanol) utilization i.e. sites of cookstove installations and distribution activities under the control of CME shall form the project boundary and be considered for project emissions. However, in accordance with paragraph 22 of the applied methodology, all other emissions, which are not within the purview of CME, are also discussed in "Project Emissions" section below.

Project Emissions

CME has ensured that all the relevant emissions that may be attributed to this PoA are discussed in either Project Emissions or Leakage section. In accordance with the applied methodology, the general approach followed to identify the project emissions associated with operations of the PoA is to determine all sources of emissions associated with activities of PoA within or outside the project boundary.

Emissions at Geographical Site of Biomass Utilization
The main project emissions relevant to the PoA is the consumption of the non-renewable biomass at the geographical site where the KOKO smart cooker are installed and operating (utilization of biomass). Project emissions due to continued use of non-renewable biomass during the operation of the project activity is already factored into the baseline emission calculation.

There are no other sources of emissions at the geographical site of biomass utilization. However, there are other sources of emissions outside the geographical site of biomass utilization, which are discussed below.

Emissions outside the Geographical Site of Biomass Utilization
The operations of PoA will require regular supply of renewable fuel bioethanol for the KOKO smart cookers, involving activities which may result in emissions outside the geographical site of biomass utilization but recommended to be considered by the applied methodology.

Supply Chain Activities:

- Fossil Fuel/Electricity Consumption during Logistics: Apart from transportation (discussed below), there is no usage of fossil fuel in the logistics activities for fuel distribution.
- Bioethanol Transportation: Before consumption at the project site, bioethanol will be transported to the project site. The bioethanol for the PoA will be first transferred from ethanol producing locations to the provincial/regional depots of the fuel procurement partner (FMC), then KOKO smart logistics will deliver the fuel to KOKOpoints, from where it would be refilled in the canisters by the end-users.
- Bioethanol Production: Bioethanol production is a regular commercial activity as it is utilized in alcohol beverages industry. At the bioethanol production sites, bioethanol will be produced using molasses which is an agro-waste from sugarcane processing mills, derived as by-product from the sugar crystallization process.

It shall be noted that supply chain activities for PoA will neither entail any crop production or harvesting activities nor any solid/liquid waste disposal activities. The bioethanol fuel is produced using molasses which is an essential by-product of sugar crystallization process. It is elaborated in section A.3. that bioethanol is produced from surplus molasses in Kenya and majority of bioethanol is exported to international alcoholic beverage industry. As per the Baseline Report of Clean Cooking Fuels in the EAC by GAIA:

"Bioethanol in Kenya is produced through the distillation of molasses, which is a waste product from the sugar production process. The largest producers in Kenya are Mumias Sugar Company, Spectre International Limited, and Agro-Food and Chemical Company. A significant product from molasses distillation is Extra Neutral Spirit, a pure potable alcohol used in the manufacture or blending of alcoholic beverages conventionally prepared as gins, vodkas, whiskies, brandies, and rums, and in fortification of wines and cream liqueurs."

Biomass cultivation in dedicated plantation for producing bioethanol is not the practice in Kenya. Hence, the scenario of dedicated plantation is not considered to be applicable on this PoA. Further, it is unrealistic to assume that any change in cultivation of sugarcane can be attributed to production of molasses which is also consistent with the applied methodology as it only requires cultivation emissions for dedicated plantations.

Emissions as per paragraph 22 of AMS-I.E. Version 9

(a) *CO2 emissions from on-site consumption of fossil fuels due to the project activity, calculated using the latest version of "TOOL03: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", including the consumption of fossil fuels for any processing of feedstock;* Apart from production of bioethanol from molasses, there is no further processing of biomass involved in the PoA. The all emissions associated with production of bioethanol are discussed in point (b) below. Moreover, the PoA does not involve consumption of fossil fuel as the only activities involved in the delivery of bioethanol are transportation and storage of fuel. While the emissions associated with transportation of fuel is discussed below, there are no emissions associated with storage of fuel.

(b) *CO2 emissions from production of bioethanol*
The applied methodology has identified production of bioethanol as one of the potential sources of emissions. Hence, CME has decided to estimate the emissions for bioethanol production. Since the sites of bioethanol production are not under the control of CME, it is not possible to implement direct monitoring of the emissions associated with bioethanol production. Under the given circumstances, CME has adopted the best possible approach of determining emissions based on the relevant information and extracts from published reports, surveys or life cycle assessment studies. As per the latest research paper published on Kenyan bioethanol production - "Lifecycle Greenhouse Gas Emissions and Energy Balances of Sugarcane Molasses-Based Bioethanol in Kenya", the total estimated net GHG emission is 270.87 gCO_{2eq}/L bioethanol for the complete lifecycle chain. The cane cultivation emits 70% of the total GHG emissions, and thus contributes a significant share to the total emissions. However, as per tool 16, these emissions are not attributable to bioethanol production if the bioethanol production does not involve dedicated plantation. As discussed above, bioethanol in Kenya is produced using surplus molasses available in the country. Similarly, Bagasse combustion, contributing 18% of the total GHG emissions, are not attributable to bioethanol production since bagasse is a renewable source of energy, hence carbon neutral. The transportation of sugar cane can only be attributed to sugar industry and not the bioethanol industry due to massive difference in economic return. Therefore, emissions occurring in only the actual bioethanol production process are included in the estimation.

Lifecycle greenhouse gas emissions for Bioethanol Production

Process	Emissions (gCO_{2eq}/L bioethanol)
Cane milling/ Bioethanol production	
Lime production	0.51
Sulphuric acid production	0.77
Urea	7.40
Yeast	0.05
Wastewater treatment	0.46

Total emissions due to Bioethanol Production	**8.73**

Based on the above analysis, annual GHG fossil fuel emissions due to bioethanol production is estimated by multiplying expected amount of bioethanol consumed by a cookstove and the specific CO2 emissions associated with bioethanol production.

(c) *CO2 emissions from electricity consumption by the project activity using the latest version of "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", including the consumption of electricity for any processing of feedstock;*

The only activity/asset that require electricity in the complete supply chain is the operations of fuel-ATM – KOKOpoints. The operation of KOKOpoint will require small amount of electricity for the display screen. This energy is supplied from the grid electricity. The total emissions will be estimated by multiplying number of KOKOpoints with the average annual electricity consumption of a KOKOpoint. The monitoring of electricity consumption will be performed in accordance with Tool 5 "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". The average electricity consumption by a KOKOpoint is estimated below which suggests negligible emissions are associated with electricity consumption at KOKOpoints.

S/N	**Particulars**	**Unit**	**Value**	**Reference**
1	Power Consumption of KOKOpoint	kW	0.02	KOKOpoint specification
2	Designed Flow-rate of KOKOpoint	ltr/min	1.5	KOKOpoint specification
3	Maximum Capacity of Smart KOKO Canister	Ltrs	2.3	Capacity of Canister is designed for 1 week of fuel consumption
4	Time required for refilling the Canister	Mins	1.53	Calculated
5	Maximum Capacity of Storage Tank in KOKOpoint	Ltrs	300	KOKOpoint specification
6	Number of Days required for making next trip to KOKOpoint	Days	2	Project Design Parameter
7	Expected Consumption of fuel per day	Ltrs	150	Calculated
4	Daily Customers supported by KOKOpoint	#	65	Calculated
5	Number of Customers per KOKOpoint	#	455	Calculated for weekly load
6	Number of Running Hours of KOKOpoint	Hours/week	11.63	Calculated
8	Total Operational Hours per Week	Hours/week	12.00	Calculated
9	Annual Operational Hours of KOKOpoint	Hours/yr	624.00	Calculated
10	Annual Power Consumption per KOKOpoint	MWh/yr	0.012	Calculated
11	Default Emission Factor	t CO2/MWh	1.3	AMS-I.E. Version 9
12	TDL	%	20%	AMS-I.E. Version 9
13	**Project Emissions due to Electricity Consumption per KOKOpoint**	**t CO2/yr**	**0.019**	
14	**Total Emission Reductions per KOKOpoint**	**t CO2/yr**	**1565.2**	Number of Cookstoves/KOKOpoint * avg.

				emission reductions per cookstove (455 * 3.44 tCO2/yr)
15	**Percentage of Emissions due to Electricity Consumption**	**%**	**0.0012**	

As per paragraph 16 of Tool 5, equation (1) is used to calculated project emissions associated with electricity consumption of KOKOpoints:

$PE_{EC,y} = \sum EC_{PJ,j,y} \times EF_{EF,j,y} \times (1+TDL_{j,y})$
$= N_{KP} \times EC_{PJ,j,y} \times EF_{EF,j,y} \times (1+TDL_{j,y})$

$PE_{EC,y}$ - Project emissions from electricity consumption in year y (tCO2/yr)
N_{KP} – Number of KOKOpoints installed under the project activity
$EC_{PJ,j,y}$ - Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr), the quantity will be monitored in accordance with Tool 5
$EF_{EF,j,y}$ - Emission factor for electricity generation for source j in year y (t CO2/MWh); A conservative default value of 1.3 tCO2/MWh is used, according to option A.2 (a) of the tool, since only project emissions are calculated and not baseline emissions.
$TDL_{j,y}$ - Average technical transmission and distribution losses for providing electricity to source j in year y; A conservative default value of 20% is used, according to option parameter/data table 3 of the tool, since leakage emissions are calculated.

(d) *Project emissions from transportation are estimated using the latest version of the tool "TOOL12: Project and leakage emissions from transportation of freight," if the transportation distance is more than 200 km; otherwise they can be neglected."*
Project emissions due to transportation of fuel within the geographical boundary of the PoA are valid emissions which may be attributed to the operations of the PoA. As per the applied methodology, transportation emissions shall be considered if the transportation distance is more than 200 kms.
Since this PoA covers the whole of Kenya, a national level assessment has been performed to understand the average transportation distances of bioethanol under the PoA. The bioethanol will be centrally procured for the PoA from the bioethanol production sites and delivered to the end-users. CME has identified the key bioethanol producing sites which are presented on the Kenyan map in fig 1 below. The data for the key bioethanol producing sites was taken from Baseline Report of Clean Cooking Fuels in the EAC by GAIA[20]. Being a mass market product, it can be safely assumed that the key geographical areas of KOKO cooker distribution under the PoA will closely relate to the regions with high population density. Hence, the population density of counties in Kenya will provide us with the information of key destinations of bioethanol. Fig 2. below presents the population density of each county in Kenya. Based on the above information, average distance between the key bioethanol producing sites and the areas of high-density population in Kenya can be estimated.

[20] Pg 100, Baseline Report of Clean Cooking Fuels in the EAC, GAIA

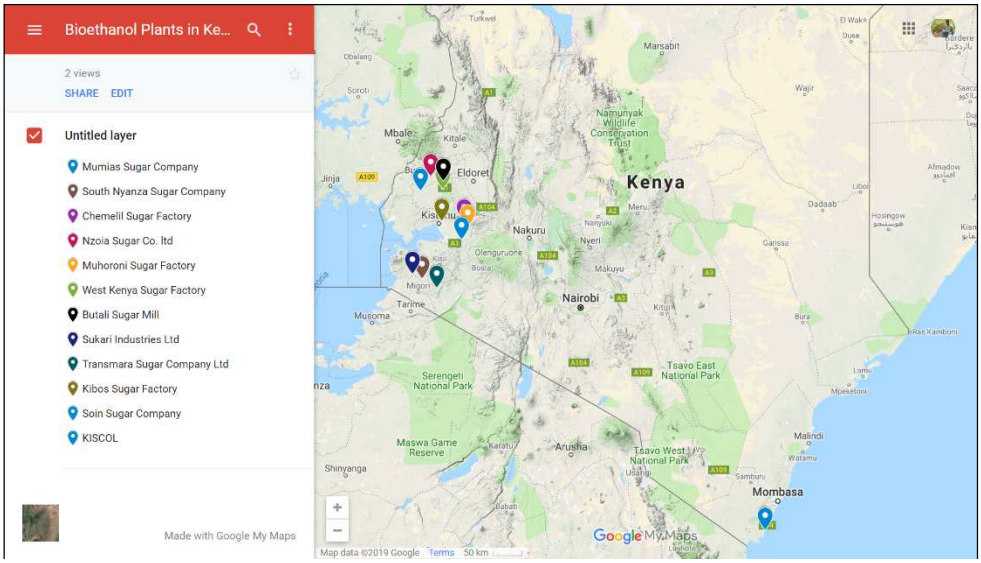

Fig. 2: Key Bioethanol Production Sites in Kenya
Prepared on Google Mymap
Source of Data: Baseline Study by GAIA

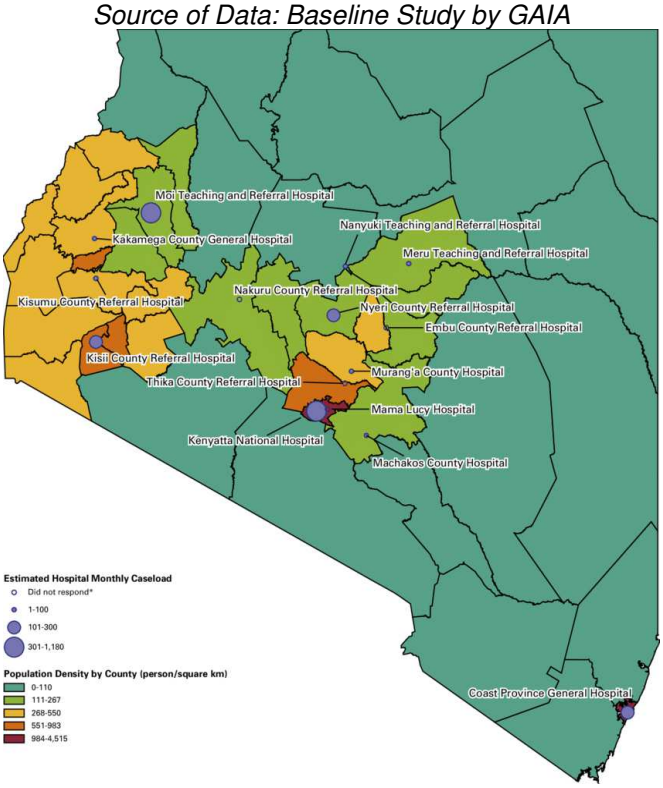

Fig. 2: Population Density of Kenya
*Source: Research Paper "Histology and Cytopathology Capacity in the Public Health Sector in Kenya" by Brand et. al. (*https://www.semanticscholar.org/paper/Histology-and-Cytopathology-Capacity-in-the-Public-Brand-Wolf/2df2766c45d9984ddc3bcb352731be9893c38207)

From the above information, it can be inferred that the western belt of Kenya is the key site of bioethanol production due to high sugarcane cultivation and hence also supports majority of population of Kenya. Since the population and bioethanol factories are distributed across the western belt, the average distance two distant bioethanol producing sites is maximum 70 kms and distance between the origin and destination of bioethanol would be less than 35 kms (distance between 2 distant origins divided by 2). Fig 3. shows the western belt of Kenya with average distance between 2 bioethanol sites.

The other key destination for bioethanol is centred at Nairobi, the capital of Kenya. These 2 destination centres cover the majority population (approx.70%) of Kenya. The average distance

between the bioethanol producing sites in the western belt and the Nairobi city is around 296 kms. The list of counties in both the destination areas are provided below.

Destination Area	Counties Covered	Population (000')	Weights
Western Belt (Area nearby Bioethanol Production Site)	Homabay, Elgeyo-Marakwet, Trans Nzoia, Kakamega, Nandi, Baringo, Narok, Kericho, Bomet, Busia, Siaya, Kisumu, Migori, Kisii, Nyamira, Vihiga, Bungoma, Kwale, Mombasa	19,366	62%
Nairobi Area	Nairobi City, Kiambu, Murunga, Kirinyaga, Nyeri, Nakuru, Nyandarua, Laikipia	12,046	38%

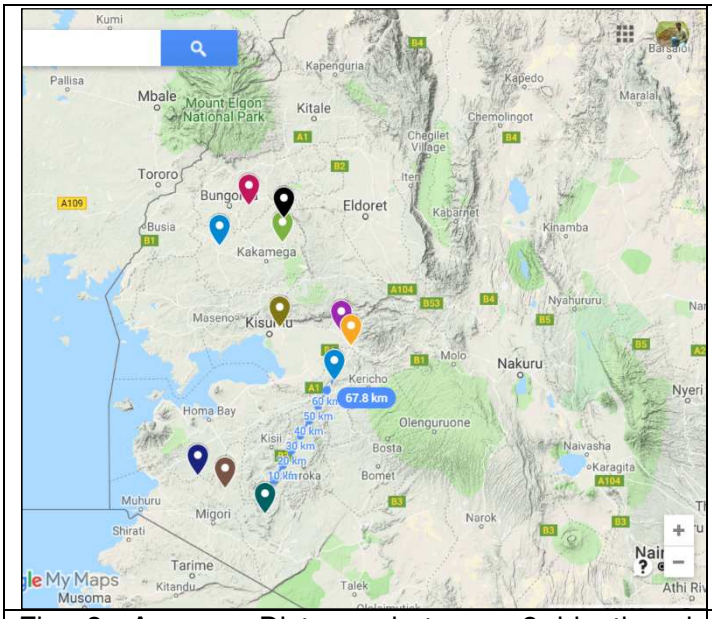

Fig. 3: Average Distance between 2 bioethanol plants

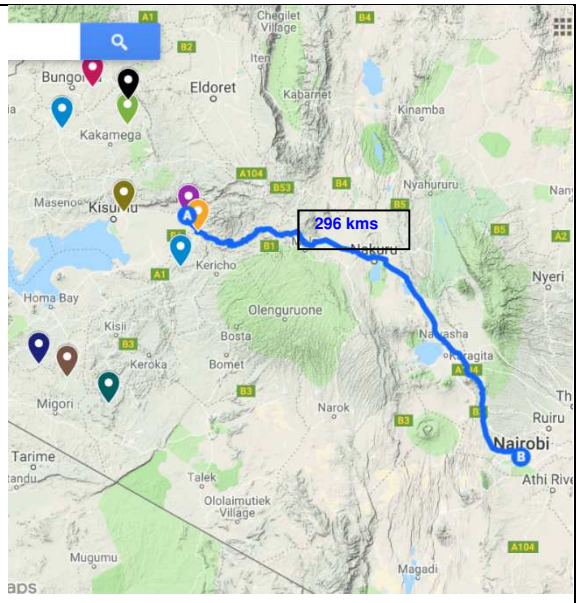

Fig. 4: Average distance between Western Belt and Nairobi City

The estimated average distance for transportation of bioethanol can be calculated by determining the weighted average distance of western belt and Nairobi area:

Area	Population Factor	Avg. Distance	Weighted Avg. Distance
Western Belt Region	62%	35 km	135 km
Nairobi Region	38%	296 km	

The conservative estimation made for average distance of transportation is less than 200 kms. These estimations are conservative since the higher distances are taken for few of the nearby counties and there are other counties apart from these destination hubs which fall within 200 kms of distance.

However, since the distribution of fuel from fuel depots to KOKOpoint is coordinated by CME, CME has conservatively considered the transport emissions associated with fuel distribution to KOKOpoints as project emissions. The dedicated transport vehicles would fill the fuel from nearby fuel depots and deliver it to all KOKOpoints making a round trip. The round trip distance of all routes will be determined and average distance per trip would be calculated. This average distance will be multiplied by the number of total trips made during the year to calculate the total distance travelled during the year. The vehicle class will also be recorded for the purpose of default Emission factor selection.

The project emissions due to transportation of fuel will be calculated by using equation (1) as described in paragraph 20 of Tool 12 "Methodological tool: Project and leakage emissions from transportation of freight":

$$PE_{TR,m} = \sum D_{f,m} \times FR_{f,m} \times EF_{CO2,f} \times 10^{-6}$$

Where:
$PE_{TR,m}$ = Project emissions from transportation of freight monitoring period m (t CO2)
$D_{f,m}$ = Return trip distance between the origin and destination of freight transportation activity f in monitoring period m (km)
$FR_{f,m}$ = Total mass of freight transported in freight transportation activity f in monitoring period m (ton)
$EF_{CO2,f}$ = Default CO2 emission factor for freight transportation activity f (g CO2/t km)

I.6.2. Data and parameters fixed ex ante

Data/Parameter 1

Data/Parameter	$f_{NRB,y}$ or f_{NRB}
Data unit	Fraction or %
Description	Fraction of woody biomass saved by the project activity during year *y* that can be established as non-renewable biomass
Source of data	Value can be determined using any one of the following options: 1. Country specific default values suggested by the CDM EB / DNA; 2. Default Values of Fraction of Non-Renewable Biomass for Least Developed Countries and Small Island Developing States, Information Note – SSC WG 35 meeting report Annex 20 (approved in EB 67, Annex 22) 3. Calculated as per Tool: Calculation of the fraction of non-renewable biomass, EB 97, Annex 9
Value(s) applied	[xx]
Choice of data or Measurement methods and procedures	The calculation method applied by the source of data shall be based on approach provided in Tool 30: "Calculation of the fraction of non-renewable Biomass"
Purpose of data	Used for calculation of baseline emissions
Additional comment	Fixed ex-ante at CPA level. Assessments, information and results established in initial CPA may be used in subsequent CPAs in lieu of conducting fresh assessments at each CPA level in absence of new data.

Data/Parameter 2

Data/Parameter	$NCV_{biomass}$
Data unit	TJ/tonne
Description	Net calorific value of biomass displaced by the project activity
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(s) applied	Wood: 0.0156 Charcoal: 0.0295
Choice of data or Measurement methods and procedures	-
Purpose of data	Used for calculation of baseline emissions
Additional comment	The parameter values are fixed ex-ante at PoA level.

Data/Parameter 3

Data/Parameter	$EF_{projected}$
Data unit	Tonnes CO_2 / TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers
Source of data	AMS-I.E. Version 9, equation (1)
Value(s) applied	63.7
Choice of data or Measurement methods and procedures	Default value as per applied methodology
Purpose of data	Used for calculation of baseline emissions
Additional comment	The parameter value is fixed ex-ante at PoA level.

Data/Parameter 4

Data/Parameter	LAF_y
Data unit	Fraction
Description	Leakage Adjustment Factor
Source of data	AMS-I.E. Version 9, equation (1)
Value(s) applied	0.95
Choice of data or Measurement methods and procedures	Default value as per paragraph (24) of applied methodology
Purpose of data	Used for calculation of baseline emissions
Additional comment	The parameter value is fixed ex-ante at PoA level.

Data/Parameter 5

Data/Parameter	$BC_{BL,PP,y}$
Data unit	tonnes/person/year
Description	Average annual consumption of woody biomass per person before the start of the project activity
Source of data	Determined ex ante using one of the following options and remains fixed during the crediting period: (a) A default value of 0.5 tonnes/person per year (b) Calculated based on historical data or published reports from reputed sources (c) Country or region specific values approved through the "procedure for development, revision, clarification and update of standardized baselines," which are available on the CDM website <http://cdm.unfccc.int/methodologies/standard_base/index.html>
Value(s) applied	[xx]
Choice of data or Measurement methods and procedures	A baseline national average value of woody biomass consumption per person will be estimated using the above source of data. It will be ensured that the historical data used for estimation of the ex-ante value is representative of the population of Kenya.
Purpose of data	Used for Calculation of baseline emissions
Additional comment	Fixed ex-ante at CPA level. Assessments, information and results established in initial CPA may be used in subsequent CPAs in lieu of conducting fresh assessments at each CPA level in absence of new data.

Data/Parameter 6

Data/Parameter	$N_{p,HH}$
Data unit	Number
Description	Average number of persons served per household prior to the project Implementation
Source of data	Published information/literature defining the average household size in the project region
Value(s) applied	[xx]
Choice of data or Measurement methods and procedures	As per applied methodology
Purpose of data	Used for calculation of baseline emissions
Additional comment	Fixed ex-ante at CPA level. Assessments, information and results established in initial CPA may be used in subsequent CPAs in lieu of conducting fresh assessments at each CPA level in absence of new data.

Data/Parameter 7

Data/Parameter	**$EF_{bioethanol\_production}$**
Data unit	g CO2/Litre of Bioethanol
Description	Project Emission Factor for production of bioethanol
Source of data	Published Life Cycle Assessment Report "Lifecycle Greenhouse Gas Emissions and Energy Balances of Sugarcane Molasses-Based Bioethanol in Kenya"
Value(s) applied	8.73
Choice of data or Measurement methods and procedures	The emissions associated with production of bioethanol which can be attributed to bioethanol are accounted in this emission factor.
Purpose of data	Calculation of project emissions due to bioethanol production
Additional comment	No comments

Data/Parameter 8

Data/Parameter	η_{Eth}
Data unit	%
Description	Efficiency of bioethanol KOKO Cooker
Source of data	Tested Efficiency as per international standards
Value(s) applied	60%
Choice of data or Measurement methods and procedures	Efficiency of KOKO Cooker as per the standard tests protocols for cookstove efficiency.
Purpose of data	Calculation of baseline emissions for SME
Additional comment	No comments

Data/Parameter 9

Data/Parameter	$EF_{EF,j,y}$
Data unit	t CO2/MWh
Description	Emission factor for electricity generation for source j in year y
Source of data	Option A.2 (a) of tool 5: Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation Version 03.0
Value(s) applied	1.3
Choice of data or Measurement methods and procedures	As per point (i) of Option A.2 of tool 5: Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation Version 03.0, the default value for Emission Factor can be applied to project and/or leakage electricity consumption sources but not to baseline electricity consumption sources. Therefore, the default value is used to calculated project emissions associated with electricity consumption at KOKOpoints in the PoA.
Purpose of data	Calculation of Project Emissions
Additional comment	No Comments

Data/Parameter 10

Data/Parameter	$TDL_{j,y}$
Data unit	%
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data	Tool 5: Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation Version 03.0
Value(s) applied	20%
Choice of data or Measurement methods and procedures	The default value is applied in accordance with the provisions under Data/Parameter Table 3 of Tool 5: Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation Version 03.0. The default value for Emission Factor can be applied to project and/or leakage electricity consumption sources but not to baseline electricity consumption sources. Therefore, the default value is used to calculated project emissions associated with electricity consumption at KOKOpoints in the PoA.
Purpose of data	Calculation of Project Emissions
Additional comment	This parameter is not included as monitoring parameter as default value is used which does not require periodic monitoring.

Data/Parameter 11

Data/Parameter	$\eta_{old,i}$
Data unit	%
Description	Efficiency of baseline appliance being replaced
Source of data	(i) Default 0.1 or 0.2 (please see details below) or (ii) Establish prior to start of implementation based on survey
Value(s) applied	[XX]
Choice of data or Measurement methods and procedures	Efficiency of pre - project device can be calculated by any of the below 2 approaches: (i) **Default Approach**: Efficiency of 0.1 will be used for a three-stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; For all other types of devices, a default value of 0.2 will be used. Weighted-average values (taking the amount of woody biomass consumed by each device as the weighting factor) will be used if more than one type of device is being replaced in a SME (ii) **Survey Approach**: CME may conduct a survey of SMEs before implementation of the PoA to calculate the average efficiency across all end-users appliances. The survey would be conducted in accordance with the CDM standard for sampling and survey version 7. The value will be calculated at the time of 1st CPA inclusion which will be applied across all CPAs.
Purpose of data	Calculation of baseline emissions for SME
Additional comment	No comments

Data/Parameter 12

Data/Parameter	$EF_{CO2,f}$
Data unit	G CO2/t km
Description	Default CO2 emission factor for freight transportation activity f
Source of data	Tool 12 "Methodological tool: Project and leakage emissions from transportation of freight"
Value(s) applied	Light Vehicle: 245 Heavy Vehicle: 145
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of transportation emissions
Additional comment	No comments

Data/Parameter 13

Data/Parameter	$D_{Ethanol}$
Data unit	Tonnes/kL
Description	Density of Bioethanol
Source of data	https://www.chemicalbook.com/CASEN_64-17-5.htm#ChemicalProperties
Value(s) applied	0.789
Choice of data or Measurement methods and procedures	Standard chemical property of Ethanol
Purpose of data	Calculation of Project Emissions due to bioethanol production
Additional comment	-

Data/Parameter 14

Data/Parameter	CF
Data unit	Unitless
Description	Wood-to-Charcoal Conversion Factor
Source of data	pg 1.44, https://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1ref3.pdf
Value(s) applied	6.0
Choice of data or Measurement methods and procedures	IPCC reports that values for estimating the amount of carbon released through charcoal production and consumption, the wood-to-charcoal factor, are stated to be between 4 and 8. Hence, 6 kg of wood input per kg of charcoal is used as default.
Purpose of data	Calculation of baseline emissions
Additional comment	-

I.6.3. Modalities for ex ante calculation of emission reductions

>>

Baseline emissions will be calculated using equation (1) provided in paragraph 20 of the applied methodology. The equation (1) is modified to incorporate methodological and operational parameters which is as given below:

$$BE_y = B_y \; x \; f_{NRB,y} \; x \; NCV_{biomass} \; x \; EF_{projected} \; x \; Stove_{year} \; x \; LAC \qquad \text{Equation (1)}$$

Where:

BE_y = Baseline emissions during the year *y* in t CO_2e

B_y = Quantity of woody biomass that is substituted or displaced in tonnes

$f_{NRB,y}$	=	Fraction of woody biomass used in the absence of the project activity in year *y* that can be established as non-renewable biomass (fNRB)
$NCV_{biomass}$	=	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne)
$EF_{projected_{fossilfuel}}$	=	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 63.7 t CO_2/TJ[21]
$Stove_{year}$		Fraction of Year(s) the cookstove i was operational during the monitoring period
LAC	=	Leakage Adjustment Factor (Default Value - 0.95)

B_y, quantity of woody biomass that is displaced, will be monitored ex post in accordance with paragraph 21 of the applied methodology. For cookstoves operational in households, Option (b) is applied to calculate parameter B_y as the product of the number of persons served per household multiplied by the number of households and the estimate of average annual consumption of woody biomass per person that is displaced by the project activity.

$$B_y = B_{HH,y} = N_{HH} x\, N_{p,HH} x\, (\, BC_{BL,PP,y} - BC_{PJ,PP,y}) \qquad \text{Equation (2)}$$

Where:

N_{HH}	=	Number of households in the project activity, number
$N_{p,HH}$	=	Average number of persons served per household, number
$BC_{BL,PP,y}$	=	Average annual consumption of woody biomass per person before the start of the project activity, tonnes/person/year
$BC_{PJ,PP,y}$	=	If it is found that pre-project devices were not completely displaced but continue to be used to some extent, average annual consumption of woody biomass per person in the pre-project devices during the project activity, tonnes/person/year

For cookstoves operational in SMEs, Option (d) is applied to calculate parameter B_y on the basis of bioethanol consumed in the SME.

$$B_y = \sum_{i}^{n} HG_{p,y} \div \left(NCV_{biomass} \times \eta_{old,i}\right) \qquad \text{Equation (3)}$$

Where:

$HG_{p,y}$ or HG_{SME}	=	Quantity of thermal energy generated by the new renewable energy technology in the project in year *y* (TJ)
$\eta_{old,i}$	=	Efficiency of pre - project device per type of device *i*

NOTE: In this PoA, $HG_{p,y}$ is referred as HG_{SME} since the approach is applicable for SME sector.

Emission Reduction Calculation per unit of project device

$B_{HH,Y}$		$N_{p,HH}$		$B_{BL,PP,y}$		$B_{PJ,PP,y}$	
Tonnes/HH/year		persons/HH	* {	tonnes/person/year	-	tonnes/person/year	}
3.96	=	4.40		0.92		0.02	

21 This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. The value is calculated, based on the global average ratio of cooking fuels (the normalized ratio of kerosene and liquefied petroleum gas (LPG) excluding coal), i.e. 9 per cent for kerosene (71.5 t CO2/TJ) and 91 per cent for LPG (63.0 t CO2/TJ).

$B_{l,Y}$		HG_{SME}		$NCV_{biomass}$			
Tonnes/SME/year		TJ/year/SME	/ {	TJ/tonne	*	%	}
13.88	=	0.026		0.0156		12%	

HG_{SME}		$Q_{SME,Eth}$		NCV_{Eth}		η_{Eth}
TJ/year/SME		Tonne/SME/year	*	TJ/tonne	*	%
0.026	=	1.57		0.0274		60%

$BE_{HH,Y}$		$B_{HH,Y}$		N_{HH}		f_{NRB}		$NCV_{biomass}$		$EF_{fossilfuel}$		$Stove_{year}$		LAC
tCO_2e/year		Tonnes/HH/year		Number		--		TJ/Tonne		tCO_2e/TJ		--		--
3.44	=	3.96	*	1	*	0.92	*	0.0156	*	63.70	*	1	*	0.95

$BE_{l,Y}$		$B_{l,Y}$		$N_{l,SME}$		f_{NRB}		$NCV_{biomass}$		$EF_{fossilfuel}$		$Stove_{year}$		LAC
tCO_2e/year		Tonnes/SME/year		Number		--		TJ/Tonne		tCO_2e/TJ		--		--
11.013	=	13.88	*	1	*	0.92	*	0.0156	*	63.70	*	1	*	0.95

$Stove_{year}(i)$ = Fraction of Year(s) the cookstove i was operational during the monitoring period

Project Emissions

Project emissions due to continued use of non-renewable biomass during the operation of the project activity is already factored into the baseline emission calculation. Since the project activity does not involve production of bioethanol, the other project emissions identified in the applied methodology are not applicable. Sample calculations are presented below describing the formulae used for project emissions.

Project Emissions due to Bioethanol Production

$PE_{bioethanol}$		$Q_{HH,Eth} + Q_{SME,Eth}$	*	$EF_{Bioethanol\_production}$
t CO2/year		Mil Ltr/year		g CO2/Litre
85.074	=	9.745		8.73

Project Emissions due to electricity consumption

$PE_{bioethanol}$		EL_{cons}	*	FE_{EL}	*	$(1+TDL_{EL})$	*	N_{KP}
T CO2/year		MWh/year		t CO2/MWh				No.
0.019	=	0.012		1.3		1.2		1

Project Emissions due to Transportation of Bioethanol

$PE_{TR,m}$		$D_{f,m}$		$FR_{f,m}$		$EF_{CO2,f}$		10^{-6}
t CO2/trip		Km	*	tonnes	*	g CO_2/ t km	*	No.
0.049	=	50		4		245		10^-6

Leakage Emissions

The leakage due to the use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources has been considered in the emission reduction calculation. In accordance with paragraph 24 of the applied methodology, a default net to gross adjustment factor of 0.95 to account for this leakage is applied.

I.7. Monitoring plan

I.7.1. Data and parameters to be monitored

Table I.7.1.1

Data/Parameter	**D_i, Date of commissioning of project device i**
Data unit	Date
Description	Actual date of commissioning of project device
Source of data	Sales Database
Value(s) applied	[XX]
Measurement methods and procedures	Each sale will be recorded in sales database along with the name of recipient, usage type, contact details, location of household (village, district etc)
Monitoring frequency	Recorded at the time of selling of project devices
QA/QC procedures	The information will be recorded electronically through a robust registration process and archived on cloud system. Periodic backup of the complete database will be automatically taken by the system.
Purpose of data	Used for calculating $Stove_{Year}(i)$, fraction of year(s) the cookstove i was operational during the monitoring period which is applied for baseline emission calculation $Stove_{Year}(i)$ = Minimum of { (End-Date of Monitoring Period – Di, Date of Commissioning of Project Device) AND (End-Date of Monitoring Period – Start-Date of Monitoring Period) } / 365
Additional comment	NA

Table I.7.1.2

Data/Parameter	**N_{HH}**
Data unit	Number
Description	Number of project devices in households of type i and batch j operating during year y
Source of data	Sales database and monitoring survey
Value(s) applied	Domestic Use Cookstoves, N_{HH}: [XX]
Measurement methods and procedures	CME will maintain online database of all stoves sold along with its usage (domestic). The information will be cross-checked during project monitoring surveys for the sample cookstoves. The proportion of operating cookstoves will be determined statistically through the monitoring surveys. The number of operating cookstoves of each type will be determined by multiplying the total sales of cookstoves under each type with the proportion of operating cookstoves of each type estimated through the monitoring survey.
Monitoring frequency	At least once every two years (biennial)
QA/QC procedures	A 95 /10 confidence / margin of error shall be achieved for the sampling parameter irrespective of annual / biennial monitoring frequency as per para 22 of Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 07.0 In the case the desired precision is not met, lower bound values shall be used against repeating the survey to determine the operational fraction of stoves.
Purpose of data	Used for calculation of baseline emissions for households
Additional comment	The thermal output of the project cookstove is sufficient to cook meals for 50-100 people at one time. Hence, it is highly unlikely that more than 1 bio-ethanol cookstove will be operational in a single household due to its high economic cost of ownership.

Table I.7.1.3

Data/Parameter	$BC_{PJ,PP,y}$
Data unit	Tonnes/person/year
Description	Average annual consumption of woody biomass in the pre-project devices during the project activity, if it is found that pre-project devices were not completely displaced but continue to be used to some extent
Source of data	Project Monitoring Survey for households
Value(s) applied	Woody Biomass Consumption per project device: [XX]
Measurement methods and procedures	A 95 /10 confidence / margin of error shall be achieved for the sampling parameter irrespective of annual / biennial monitoring frequency as per para 22 of Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 07.0 In the case the desired precision is not met, lower bound values shall be used against repeating the survey to determine the operational fraction of stoves.
Monitoring frequency	At least once every two years (biennial)
QA/QC procedures	The Guidelines for Sampling and Surveys will be referred to adopt the best practices for conducting the surveys.
Purpose of data	Used for calculation of baseline emissions
Additional comment	NA

Table I.7.1.4

Data/Parameter	$Q_{HH,Eth}$ and $Q_{SME,Eth}$
Data unit	Litres/day
Description	Average daily consumption of bioethanol in a project cookstove (KOKO cooker) distributed to Households and SMEs as part of the PoA/CPA
Source of data	Project Monitoring Survey for Households and SMEs
Value(s) applied	Daily consumption of bioethanol in project households: [XX] Daily consumption of bioethanol in project SMEs: [YY]
Measurement methods and procedures	A 95 /10 confidence / margin of error shall be achieved for the sampling parameter irrespective of annual / biennial monitoring frequency as per para 22 of Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 07.0 In the case the desired precision is not met, lower bound values shall be used against repeating the survey to determine the operational fraction of stoves.
Monitoring frequency	At least once every two years (biennial)
QA/QC procedures	The Guidelines for Sampling and Surveys will be referred to adopt the best practices for conducting the surveys.
Purpose of data	Calculation of Baseline Emissions for SMEs
Additional comment	No Comments

Table I.7.1.5

Data/Parameter	$N_{l,i}$
Data unit	Number
Description	Number of project devices of type i and batch j operating in institutions during year y
Source of data	Sales database and project monitoring survey of institutions
Value(s) applied	Commercial/Institutional Use Cookstoves, $N_{l,i}$: [YY]
Measurement methods and procedures	CME will maintain online database of all stoves sold along with its usage (commercial/institution). The information will be cross-checked during project monitoring surveys for the sample cookstoves. The proportion of operating cookstoves will be determined statistically through the monitoring surveys in institutions. The number of operating cookstoves of each type will be determined by multiplying the total sales of cookstoves under each type with the proportion of operating cookstoves of each type estimated through the monitoring survey.
Monitoring frequency	At least once every two years (biennial)
QA/QC procedures	A 95 /10 confidence / margin of error shall be achieved for the sampling parameter irrespective of annual / biennial monitoring frequency as per para 22 of Standard: Sampling and surveys for CDM project activities and programmes of activities, Version 07.0 In the case the desired precision is not met, lower bound values shall be used against repeating the survey to determine the operational fraction of stoves.
Purpose of data	Used for calculation of baseline emissions
Additional comment	No Comments

Table I.7.1.6

Data/Parameter	$N_{KP,y}$
Data unit	Number
Description	Number of KOKOpoints operating during year y
Source of data	Database of installed KOKOpoints under operations
Value(s) applied	[XX]
Measurement methods and procedures	A real-time database will be maintained to keep record of all operational KOKOpoints. All KOKOpoints will be connected to internet and hence will be monitored for operational status online.
Monitoring frequency	Continuously monitored, recorded annually
QA/QC procedures	As the database will be generated from online monitoring, it will be highly reliable and does not require further review. The technical support team will ensure that each of the non-operational KOKOpoint is attended in a timely manner. Any discrepancy in the actual status and database will be highlighted by the technical team at the earliest.
Purpose of data	Calculation of project emissions due to electricity consumption at KOKOpoints.
Additional comment	No Comments

Table I.7.1.7

Data/Parameter	$NCV_{i,biomass}$
Data unit	TJ/tonne
Description	Net calorific value of the fuel type "i" used in project scenario including non-renewable woody biomass, charcoal or renewable bio-ethanol.
Source of data	IPCC Guidelines for National Greenhouse Gas Inventories 2006 https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf
Value(s) applied	<table><tr><th>Notation</th><th>Fuel Type "i"</th><th>Default NCV Value (TJ/tonne)</th></tr><tr><td>$NCV_{Wood,Biomass}$</td><td>Wood Fuel</td><td>0.0156</td></tr><tr><td>$NCV_{Charcoal,Biomass}$</td><td>Charcoal</td><td>0.0295</td></tr></table> The NCV of bioethanol (NCV_{Eth}) will be monitored annually.
Measurement methods and procedures	Default value for all fuels utilized in the PoA will be sourced from IPCC Guidelines for National Greenhouse Gas Inventories 2006. The monitoring of NCV of bioethanol (NCV_{Eth}) will be conducted either in-house using the bomb-calorimeter or by third party testing agency.
Monitoring frequency	Yearly
QA/QC procedures	CME will ensure that the NCV determination is performed as per the national/international standards and procedures.
Purpose of data	Calculation of Project Emissions
Additional comment	No Comments

Table I.7.1.8

Data/Parameter	HG_{SME}
Data unit	TJ/year
Description	Quantity of thermal energy generated by the new renewable energy technology in the project in year *y* (TJ)
Source of data	Calculated based on bioethanol consumption
Value(s) applied	Average thermal energy generation by an SME = [YY]
Measurement methods and procedures	The annual thermal energy generation by an SME is based on bioethanol quantity consumed by the SME which is determined using ex-post annual sampling-based survey (Please refer parameter I.7.1.4 above).
Monitoring frequency	Annual
QA/QC procedures	-
Purpose of data	Used for calculation of baseline emissions
Additional comment	No Comments

Table I.7.1.9

Data/Parameter	$EC_{PJ,j,y}$
Data unit	MWh/year
Description	Quantity of electricity consumed by the project electricity consumption source j in year y
Source of data	Calculated from monitoring of installed KOKOpoints and number of hours during the monitoring period
Value(s) applied	[ZZ]
Measurement methods and procedures	Since the direct monitoring through meters is not possible due to decentralized units with no separate electricity meters, the overall electricity consumption of KOKOpoints will be estimated by multiplying the total number of hours in the monitoring period, the rated electrical consumption of the KOKOpoints (kW) and the number of KOKOpoints installed (Monitored parameter). This approach assumes continuous running of KOKOpoints at full capacity during the monitoring period. This is the most conservative estimation possible of electricity consumption by KOKOpoints because the KOKOpoint stores are only open for approximately 10 hours in a day with an average running of fuelATMs of about 1-2 hours.
Monitoring frequency	Continuous (monitoring of installed KOKOpoints)
QA/QC procedures	N/A
Purpose of data	Calculation of Project Emissions due to electricity consumption
Additional comment	The power consumption rating of these KOKOpoints is 20 W which results in project emissions of less than 1% of emission reductions due to electricity consumption in a given period.

Table I.7.1.10

Data/Parameter	$D_{f,m}$
Data unit	Kilometre
Description	Return trip distance between the origin and destination of freight transportation activity f in monitoring period m
Source of data	Records of vehicle operator or records by project participants
Value(s) applied	[XX]
Choice of data or Measurement methods and procedures	Determined once for each freight transportation activity f for a reference trip using the vehicle odometer or any other appropriate sources (e.g. on-line sources)
Monitoring frequency	To be updated whenever the distance changes
QA/QC procedures	Wherever possible, pre-defined routes will be identified, and the actual distance of the trip will be determined through a pilot trip. The same distance can be used as default distance for all subsequent trips on the same route. In case, if there is no fixed route followed, then the actual distance of such trip will be monitored using the vehicle odometer/trip meter or any other appropriate means.
Purpose of data	Calculation of project emissions due to transportation
Additional comment	No Comments

Table I.7.1.11

Data/Parameter	$FR_{f,m}$
Data unit	Tonnes
Description	Total mass of freight transported in freight transportation activity f in monitoring period m
Source of data	Records by project participants or records by truck operators
Value(s) applied	[XX]
Choice of data or Measurement methods and procedures	The parameter will be recorded in accordance with tool 12 "Methodological tool: Project and leakage emissions from transportation of freight". The micro-tankers, technically designed for safely carrying ethanol, are used for transport of bioethanol from local fuel stations to the nearby KOKOpoints. A micro-tankers is completely filled up to its technical capacity before being dispatched from fuel station for KOKOpoint refills. Hence, capacity of the micro-tanker is recorded for monitoring of total mass of bioethanol transported during a monitoring period.
Monitoring frequency	Continuous monitoring
QA/QC procedures	The capacity of each micro-tanker will be recorded electronically before dispatch from local fuel stations. The record will be maintained by the CME as the local logistics are under its control. There is some dead weight left in the micro-tankers, after each trip of refilling the KOKOpoints. which cannot be decanted from the micro-tankers. Hence, applying full capacity of micro-tanker for project emission calculation is conservative.
Purpose of data	Calculation of project emissions due to transportation
Additional comment	No Comments

I.7.2. Sampling plan

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The CPA shall follow the following sampling plan:

Sampling Plan across CPAs within the PoA
Representative sampling will be undertaken as part of a cross-CPA sampling plan that is designed in line with the requirements of the methodology applied and the Standard: Sampling and surveys for CDM project activities and programmes of activities, version 7.0.

Sample sizes will be sufficient to ensure that the precision of the sample means/proportions are in accordance with the methodological / standard requirements. In cases where survey results indicate that desired precision is not achieved, the lower bound value of corresponding confidence interval of the parameter value may be used as an alternative to repeat the survey. Alternatively, the survey may be expanded to reach the required confidence/precision.

In order to ensure that parameter values obtained through sampling are non biased and that data collection minimizes non-sampling (non-random, systematic) errors, the CPA will observe sound practices in designing samples and administering surveys and field measurements as outlined in the "Guidelines for sampling and surveys for CDM project activities and programme of activities" and estimation of sample size will be guided by the type of parameter being sampled that it either proportion parameter or mean parameter.

The Standard (paragraph 22) mandates application of 95/10 confidence/precision for CPAs solely composed of micro-scale CDM units hence the same shall be applied.

Sampling Methodology

Sampling Objective – The sampling objective for each parameter is to determine, via sampling survey / test, a statistically significant parameter value for the emission reduction calculations. These parameters are as listed I.7.1 above.

Field Measurement Objective and data to be collected – The value of monitoring parameters included in section I.7.1 will be measured through appropriate statistical sampling methods. The below table summarizes the list of parameters, type and the sampling methods to be used during project surveys.

S.No.	Monitoring Parameter	Sampling Parameter	Parameter Type	Target Population
1	Number of project devices distributed in households operating during year y, N_{HH}	Proportion of Operating Cookstoves	Proportion	Cookstoves distributed in households as part of project activity
2	Number of project devices distributed in institutions operating during year y, $N_{I,i}$	Proportion of Operating Cookstoves	Proportion	Cookstoves distributed in institutions as part of project activity
3	Average annual consumption of woody biomass per household in the pre-project devices during the project activity, if it is found that pre-project devices were not completely displaced but continue to be used to some extent, $BC_{PJ,HH,Y}$	Daily/Weekly/Monthly consumption of woody biomass per household	Mean	Cookstoves distributed in households as part of project activity. Different alternative means like proportion of meals cooked on pre-project devices, expense incurred on baseline fuel may be applied to calculate this parameter.
4	Average annual bioethanol consumption per household during the operations of the project activity, $Q_{HH,Eth}$	Daily/Weekly/Monthly consumption of bioethanol	Mean	Cookstoves distributed in households as part of project activity
5	Average annual bioethanol consumption per SME during the operations of the project activity, $Q_{SME,Eth}$	Daily/Weekly/Monthly consumption of bioethanol	Mean	Cookstoves distributed in SMEs as part of project activity
6	Average number of persons equivalent served by the institution with full meals, $n_{p,I}$	Number of meals served by the institution	Mean	Cookstoves distributed in institutions as part of project activity

Target population and sampling frame – The target population is the total population served under the PoA and the sampling frame consists of aggregated data of end-users of the cookstoves as recorded in the CPA Databases. The sampling frame will be kept for 2 years following the crediting period or the last issuance of the CERs of the project activity.

Sample method –Sampling will be conducted using either simple or stratified random sampling techniques over the sampling frame. The survey implementation and calculations will be performed as per CDM guidelines "Sampling and surveys for CDM project activities and programmes of activities" Version 4.0. Optionally, other sampling approaches may be used in accordance with Standard"Sampling and surveys for CDM project activities and programmes of activities" and Guideline for Sampling and Surveys for CDM Project Activities and Programme of Activities, when sampling techniques or statistical analysis necessitates it.

Desired precision / expected variance and sample size – unless otherwise noted in the measurement methods and procedures section of the monitored parameter table in section B.7.1, and as allowed by applicable methodology, the sample size will be chosen for a 95/10 precision (95% confidence interval and 10% margin of error).

Depending on the sampling type, appropriate formula for calculating sample size will be applied as described in Guideline: Sampling and Surveys for CDM project activities and programme of activities, Version 4.0. For illustration, the following formulae may be used for proportion parameters based on the sampling type:

For simple random sampling:
$n \geq 1.96^2 * N * p(1-p) / \{ (N-1) * 0.1^2 * p^2 + 1.96^2 * p * (1-p) \}$

Where:
n = Sample size
N = Total number of households
p = Expected proportion value
1.96 = Represents the 95% confidence required
0.1 = Represents the 10% relative precision

For Stratified random sampling:
$n \geq 1.96^2 * N * V / \{ (N-1) * 0.1^2 + 1.96^2 * V \}$

$V = SD^2 / p\_bar^2$

Where:
SD^2 = Overall weighted-average Variance
p_bar = Overall weighted average proportion
n = Sample size
N = Total number of households
V = Expected proportion value
1.96 = Represents the 95% confidence required
0.1 = Represents the 10% relative precision

During sampling, there may be non-response from the target population. Over-sampling may be used to avoid non-response, however, sampling may be cease once required confidence/precision is met. In the case of parameters monitored for the first time the expected variation for that measure in the sample may be based on results from similar studies, pilot studies, or from the project planner's own knowledge / experience of the data (as per para 12 of Standard).

I.7.3. Other elements of monitoring plan

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To reduce monitoring efforts, a single sample set is drawn based on which various parameters shall be monitored. The CME will determine the number of samples to be monitored for each of the parameters separately. The CME may decide to stop monitoring of a parameter during the campaign once the required precision for this parameter is achieved. The monitoring team may continue to monitor appliances in the sample with respect to the remaining parameter(s) until again the required precision for these parameters is achieved. The design of the survey questionnaire will ensure that the questions are non-intrusive and easy to understand for both the interviewee and interviewer.

Training will ensure that all monitoring staff has the appropriate skills and experience to administer relevant surveys / tests and quality checks will ensure the integrity of information flow to the CME. The CME shall review the efficacy of information gathering techniques and information flow and assess enumerator and partner feedback to make improvements as deemed necessary.

Any third parties hired by the CME, if any, to carry out sampling should have requisite skills and

appropriate experience with data entry and data management. The CME will ensure that contractors are adequately trained for the tasks they are contracted for. Training will also be provided on how to deal with non-responses, refusals and other problems should these occur.

SECTION J. Crediting period type and duration

>>
10 years and 0 months, fixed.

SECTION K. Eligibility criteria for inclusion of CPAs

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No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
1	Ref: Project Standard for PoA Version 2.0 Para.120(a): The geographical boundary of the CPA including any time-induced boundary consistent with the geographical boundary set in the PoA	The PoA boundary corresponds to the boundaries of Kenya. Each CPA will be located within Kenya. Any cookstove sold outside Kenya will not be counted as part of the PoA.	Evidence for inclusion: CPA-DD section A.7, specifying location and boundary of the CPA.
2	Ref: Project Standard for PoA Version 2.0 Para.120(b): Conditions that avoid double counting of emission reductions like unique identification of product and end-user locations	A unique numbering system for cookstoves will be applied in each CPA, assigning a unique number to each cookstove and allowing to clearly identify for each cookstove to which CPA it belongs. Before handing over the cookstove to the end-user, the complete information of the end-user is electronically registered and stored on the cloud server and the cookstove serial number is assigned to the registered user.	Online application and registration of the end-user.
3	Ref: Project Standard for PoA Version 2.0 Para.120(c): Conditions to confirm that CPAs are neither registered as CDM project activities, included in another registered PoAs, nor the project activities that have been Deregistered	The CPA is exclusively bound to the PoA. Confirmation that the programme activity has not been and will not be registered either as a single CDM project activity or as a CPA under another PoA or under a project activity which has been registered.	A statement is provided that the CPA is not part of any other CDM project activity.

4	Ref: Project Standard for PoA Version 2.0 Para.120(d): The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications	1. Technology - The PoA will promote dissemination of portable bio-ethanol cookstoves in Kenya 2. Key Specifications: • **Thermal Output**: Between 1.4 kW and 1500 kW • **Thermal Efficiency**: More than 45% • **Fuel**: Bioethanol The Cookstoves, to be distributed under the CPA, are designed and constructed in accordance with the national safety and performance regulation on bio-ethanol cookstoves of Kenya – "Ethanol Fuelled Cooking Appliances Specifications".	Technical Specification Details to be made available by the CPA to demonstrate compliance with the eligibility conditions. An internal approval requirement from CME for the fuel type.
5	Ref: Project Standard for PoA Version 2.0 Para.120(e): Conditions to check the start date of the CPA through documentary evidence	Date on which first cookstove is sold/installed under the CPA. The start date of any proposed CDM CPA will be on or after the start date of the proposed CDM PoA.	End user agreement / voucher / installation report etc for the first cookstove sold/installed under the CPA.
6	Ref: Project Standard for PoA Version 2.0 Para.120(f): Conditions that ensure compliance with applicability and other requirements of the methodology	CPA must follow AMS-I.E. Version 09.0. The applicability of methodology at CPA level has already been demonstrated in section I.2 above. Technology related requirements have been specified in criteria #3 above.	CPA-DD applying methodology AMS-I.E. Version 09.0.
7	Ref: Project Standard for PoA Version 2.0 Para.120(g): The conditions that ensure that the CPA meets the requirements pertaining to the demonstration of additionality	1. The cookstove shall be used in household or SME. 2. The unit capacity of the cookstove shall be less than 1500 kW.	1. The verification of the end-user (whether household or SME) will be done at the time of sale of cookstove. The registration details will be available as proof of verification. 2. The specifications of the cook stove models will be approved by the CME before distribution. Proof: Cookstove Specification Details
8	Ref: Project Standard for PoA Version 2.0 Para.120(h): The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis	The local stakeholder consultation is conducted at the PoA level (Section F of the PoA-DD). An environmental impact analysis is not required (section E of the PoA-DD)	Not Applicable

9	Ref: Project Standard for PoA Version 2.0 Para.120(i): Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance	Affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance	Please refer Appendix 2. Declaration from CME that no funds for official development assistance will be used for program implementation.
10	Ref: Project Standard for PoA Version 2.0 Para.120(j): Where applicable, target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off-grid) and distribution mechanisms (e.g. direct installation)	Target Group: Households / SMEs Cookstove Distribution Mechanism: Direct Distribution through KOKOpoints	Sales Database and associated KOKO Agent details
11	Ref: Project Standard for PoA Version 2.0 Para.120(k): Where applicable, the conditions related to sampling requirements for the PoA in accordance with the "Standard for sampling and surveys for CDM project activities and programme of activities"	CPAs under the program will adhere to all requirements as mentioned in Standard: "Sampling and surveys for CDM project activities and programme of activities"	CPAs will follow monitoring plan described in CPA-DD section I.7.2.
12	Ref: Project Standard for PoA Version 2.0 Para.120(l): Where applicable, the conditions that ensure that every CPA (in aggregate if it comprises of independent sub units) meets the small-scale or microscale threshold and remains within those thresholds throughout the crediting period of the CPA	CME will ensure that all CPAs are solely composed of "microscale CDM units", hence the CME is not required to demonstrate compliance with the small-scale CDM thresholds at the aggregate level of the CPA. As a result, unlimited cookstove units can be included in a CPA under this PoA.	Not Applicable
13	Ref: Project Standard for PoA Version 2.0 Para.120(m): Where applicable, the requirements for the debundling check, in case the CPAs belongs to small-scale or microscale project categories.	CME will ensure that all CPAs are solely composed of "microscale CDM units", hence the CME is not required to perform de-bundling check.	Not Applicable
14	Approval of CPA by CME	The CME approves each CPA to be included into its registered PoA after detailed technical review.	Statement of CME giving approval for the CPA to be included into its registered PoA along with technical review report.

15	CER ownership	End users receiving cookstove under the specific CPA cede their rights to claim and own emission reductions under the Clean Development Mechanism of the UNFCCC to the CME of the PoA.	A default sales agreement for end users including the provision that emission reductions generated by the stove are owned by the CME will be provided for each CPA

Appendix 1. Contact information of coordinating/managing entity and project participants

Coordinating/managing entity and/or project participants	☒ Coordinating/managing entity ☒ Project participant
Organization name	KOKO Networks Limited
Country	Republic of Kenya
Address	Level 5, Rivaan Centre, Westlands, Nairobi, Kenya
Telephone	+254 718 472 200
Fax	N/A
E-mail	g.murray@kokonetworks.com
Website	www.kokonetworks.com
Contact person	Greg Murray

Appendix 2. Affirmation regarding public funding

Declaration from CME

Public Funding Declaration

Project Details	PoA Title: KOKO Kenya – Ethanol Cookstoves Program CPA Title: Not Applicable
Entity Type	☒ Coordinating & Managing Entity ☐ CPA Implementer ☐ Local Partner
Entity Name & Registered Office Address	KOKO Networks Limited Level 5, Rivaan Centre, Westlands, Nairobi Republic of Kenya
Declaration by Entity	The entity hereby declares that the funds allocated and/or utilized for the implementation of the proposed ~~CPA~~/PoA are all secured from legitimate sources and ~~does~~/does not involve funding(s) from any public sources. In case of involvement of any public sources of funds, it is further declared that the sourced funds do not result in diversion of funds allocated for Official Development Assistance (ODA).
Authorized Signatory Details	Greg Murray Chief Executive Officer
Signature	

Declaration from CPA Implementer

Public Funding Declaration

Project Details	PoA Title: KOKO Kenya – Ethanol Cookstoves Program CPA Title: CPA-0001: KOKO Kenya - Ethanol Cookstoves Program CPA-0002: KOKO Kenya - Ethanol Cookstoves Program
Entity Type	☐ Coordinating & Managing Entity ☒ CPA Implementer ☐ Local Partner
Entity Name & Registered Office Address	KOKO Networks Limited Level 5, Rivaan Centre, Westlands, Nairobi Republic of Kenya
Declaration by Entity	The entity hereby declares that the funds allocated and/or utilized for the implementation of the proposed CPA/~~PoA~~ are all secured from legitimate sources and ~~does~~/does not involve funding(s) from any public sources. In case of involvement of any public sources of funds, it is further declared that the sourced funds do not result in diversion of funds allocated for Official Development Assistance (ODA).
Authorized Signatory Details	Gregory Murray Chief Executive Officer
Signature	

Appendix 3. Applicability of methodologies and standardized baselines

Not Applicable

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

Not Applicable

Appendix 5. Further background information on monitoring plan

Not Applicable

Appendix 6. Summary report of comments received from local stakeholders

Please refer section F.3.

Appendix 7. Summary of post-registration changes

The following permanent changes to the operation and monitoring of the PoA and associated CPAs have been identified by the CME:

Proposed Revision to PoA-DD	Type of Change	Reason
Investor details (pg 3)	Correction (editorial addition in the description)	The information included in the existing PoA-DD was incomplete. The correct and complete details of the investors involved in financing of the CPAs are included in the revised PoA-DD.
Description of fuel procurement partner and procurement process (pg 6)	Correction (editorial addition in the description)	The information related to fuel procurement process and related parties was incomplete in the existing PoA-DD. The fuel procurement process is further elaborated, and a flow-chart is included for explaining the responsibility related to fuel logistics.
Revision to demonstration of methodological applicability condition#1 (pg 20)	Correction (Information reflecting the operations of the PoA)	In the registered PoA-DD, the compliance with the applicability condition 1 was demonstrated through the inspection process to establish traceability of the fuel to the bioethanol production site which is not an accurate representation of the on-ground operational processes at KOKO. Hence, a provision of declaration of renewable nature of fuel from the trader/FMC is included which reflects the on-ground operational process to ensure that

		bioethanol fuel delivered to KOKOpoints is always from renewable source only.
Addition of Ex-Ante Parameters (pg 38-39)	Correction (correction of typographical error)	The following parameters were reported and applied in the ER calculation sheet for CPA-1 and CPA-2 but were mistakenly omitted from the generic CPA-DD. Hence, the generic CPA-DD is revised to include the same. a) $D_{Ethanol}$ - Density of Bioethanol b) CF - Wood-to-Charcoal Conversion Factor
Formula Correction in Monitoring Parameter (pg 42)	Correction (correction due to typographical error)	The formula for calculating $Stove_{year}$ in monitoring parameter "Date of commissioning of project device i" is corrected as the formula reported in original PoA-DD contained typographical error.
Revision in procedures of Monitoring Parameters (pg 46-47)	Permanent Changes to the registered monitoring plan (proposed changes to the monitoring parameters)	The following monitoring parameters were revised as CME was unable to implement the monitoring procedures as per the original PoA-DD: a) $EC_{PJ,I,y,}$ Quantity of electricity consumed by the project electricity consumption source j in year y – Due to decentralized model of fuel-ATMs, the separate metering of each fuel-ATM cannot not be implemented. b) $D_{f,m}$ Return trip distance between the origin and destination of freight transportation activity f in monitoring period m – The description of the recording process of the distance was ambiguous in the PoA. c) $FR_{f,m}$ Total mass of freight transported in freight transportation activity f in monitoring period m – CME is not able to accurately measure the amount transferred by microtankers to the fuel-ATMs. It is ensured by the CME that the alternative procedure included in the revised PoA-DD are either more accurate or conservative with respect to emission reduction calculation.
Revision in procedures of Sampling Plan (pg 48)	Permanent Changes to the registered monitoring plan	Changes to the description in the sampling plan (I.7.2) are made to improve transparency of the procedures that may be employed for sampling and survey.

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Document information

Version	*Date*	*Description*
09.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN); • Make editorial improvements.

Version	*Date*	*Description*
08.1	28 June 2017	Revision to: • Remove a duplicated instruction; • Make editorial improvement.
08.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for programmes of activities" and with the PDD and CPA-DD forms; • Make editorial improvement.
07.0	25 May 2017	Revision to: • Ensure consistency with the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN) (version 01.0); • Incorporate the "Programme design document form for small-scale CDM programmes of activities" (CDM-SSC-PoA-DD-FORM); • Make editorial improvement.
06.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
05.0	9 March 2015	Revision to: • Include provisions related to choice of start date of PoA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Add exception for generic CPA where technology is under positive lists; • Make editorial improvement.
04.1	5 August 2014	Editorial revision to correct the document information table.
04.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM programme of activities (these instructions supersede the Guideline: Completing the programme design document form for CDM programme of activities (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the PoA in B.4 and Appendix 1; • Add general instructions on post-registration changes in paragraphs 2 and 3 of general instructions and Appendix 6; • Change the reference number from F-CDM-PoA-DD to CDM-PoA-DD-FORM; • Make editorial improvement.
03.0	3 December 2012	EB 70 Revision to reflect changes to the *Guideline: Completing the programme design document form for CDM programmes of activities* (EB 70, Annex 6).

Version	*Date*	*Description*
02.0	13 March 2012	EB 66 Revision required to ensure consistency with the "Guidelines for completing the programme design document form for CDM programmes of activities" (EB 66, annex 12).
01.0	27 July 2007	EB 33, Annex 41 Initial publication.

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: programme of activities, project design document